TM 11-1352

WAR DEPARTMENT TECHNICAL MANUAL

RADAR SET AN/TPL-1

HQ-710

WAR DEPARTMENT • NOVEMBER 1944

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TM 11-1352

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RADAR SET AN/TPL-1

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TABLE OF CONTENTS

		Paragraph	Page
CHAPTER 1.	General description.		
SECTION I.	Purpose and functioning of Radar Set AN/TPL–1.		
	Purpose	1	1
	Type of target information	2	1
	Range determination	3	1
	Scanning in azimuth	4	2
	Scanning in elevation	5	3
	Target-information indicators	6	5
II.	Components of the equipment.		
	General description	7	7
	Console Cabinet CY–153/TPL–1	8	8
	Pedestal AB–39/TPL–1	9	11
	Antenna Assembly AS–113/TPL–1	10	12
	Tent	11	13
	Grouping of components	12	13
III.	Transmitting group.		
	General	13	14
	Modulator MD–31/TPL–1	14	14
	Rectifier Power Unit PP–88/TPL–1	15	14
	Pulse Transformer MX–187/TPL–1	16	14
	Transmitter oscillator	17	14
IV.	Receiving group.		
	General	18	15
	Crystal mixer	19	15
	Local oscillator	20	15
	Pre-Amplifier AM–42/TPL–1	21	15
	Radar Receiver R–85/TPL–1	22	15
V.	Indicating group.		
	General	23	16
	Synchronizer SN–14/TPL–1	24	16
	Range Indicator Unit ID–81/TPL–1	25	18
	Tracking Indicators ID–82/TPL–1	26	18
	Main Drive Assembly MX–186/TPL–1	27	19
	Rectifier Power Unit PP–89/TPL–1	28	19

			Paragraph	Page
SECTION	VI.	R-F group.		
		General	29	20
		R-f line	30	20
		Antenna Assembly AS–113/TPL–1	31	20
		T/R box	32	20
	VII.	Control group.		
		General	33	20
		Switches	34	20
		Circuit breakers	35	22
		Meters	36	23
		Variable electrical controls	37	24
		Variable mechanical controls	38	26
		Miscellaneous control devices	39	27
	VIII.	Nomenclature, physical data, and power requirements.		
		List of major components	40	27
		Power requirements	41	27
		Physical data	42	29
	IX.	Test equipment and tools.		
		Test equipment	43	29
		Tool equipment	44	29
CHAPTER 2.		Installation.		
SECTION	I.	Siting.		
		Tactical considerations	45	32
		Technical considerations	46	32
		Practical considerations	47	32
	II.	Setting-up procedure.		
		Installation	48	33
CHAPTER 3.		Operation.		
SECTION	I.	Starting procedure and adjustments.		
		Preliminary steps	49	38
		Starting procedure	50	38
		Adjustments	51	42
	II.	Technical operation.		
		Automatic search	52	47
		Manual tracking	53	48
	III.	Stopping procedure.		
		Normal stopping	54	49
		Emergency stopping	55	49

		Paragraph	Page
CHAPTER 4.	Equipment performance log.		
SECTION I.	General information.		
	Equipment performance log	56	50
	Description of the log	57	50
	General instructions for filling in the log sheet	58	51
	Corrective measures	59	51
II.	Specific log procedures.		
	Method of filling in front of log sheet	60	52
	How to fill in the back of the log	61	61
CHAPTER 5.	Conversion for travel.		
	Preparation for travel	62	66
APPENDIX I.	Orientation and synchronization with searchlights.		
	Orientation	1	67
	Synchronizing the data system	2	67
APPENDIX II.	First assembly of set.		
	Dimensions and weights of crates	1	70
	Assembly of pedestal and antenna, and paraboloid	2	70
	Assembly of r-f coaxial line	3	71

LIST OF ILLUSTRATIONS

Fig. No.	*Title*	*Page*
1	Radar Set AN/TPL–1	xii
2	Radar Set AN/TPL–1, front and right end	2
3	Determining azimuth angle of a target	2
4	Determining slant range of a target	3
5	Determining elevation angle of a target	3
6	Determining altitude of a target	3
7	Slant range indication on range scope	3
8	Scanning in azimuth with Radar Set AN/TPL–1	3
9	Scanning in elevation with Radar Set AN/TPL–1	4
10	Scanning in azimuth and elevation	4
11	Information indicators	4
12	PPI and range scope presentation	5
13	Antenna, pedestal, and cabinet break-down	7
14	Front of cabinet, component location	8
15	Front of cabinet, panels removed	9
16	Rear of cabinet, component location	10
17	Rear of cabinet, panels removed	10
18	Pedestal base, front and right side	11
19	Pedestal base, left side	11
20	Pedestal column, top	12
21	Antenna assembly AS–113/TPL–1	13
22	Local oscillator	15
23	Pre-Amplifier AM–42/TPL–1	15
24	Radar Receiver R–85/TPL–1	16
25	Synchronizer SN–14/TPL–1	17
26	Range Indicator Unit ID–81/TPL–1	17
27	Tracking Indicator ID–82/TPL–1	18
28	Main Drive Assembly MX–186/TPL–1	18
29	24-volt supply. Rectifier Power Unit PP–89/TPL–1	19
30	Blower switch and winter-summer switch	22
31	Interlock switch	22
32	Circuit breaker panel	23
33	Location of meters	23
34	Left control panel	24
35	Right control panel	25
36	Test equipment	28
37	Signal generator	29
38	Tool equipment	30
39	Location of Radar Set AN/TPL–1 using curvature of earth for protection	32
40	Location of Radar Set AN/TPL–1 using local building for protection	32
41	Location on step of shore line	32

Fig. No.	Title	Page
42	Location of Radar Set AN/TPL–1, elevated position	32
43	Location of Radar Set AN/TPL–1 in mountains	32
44	Radar Set AN/TPL–1 with searchlight, block diagram	33
45	Radar Set AN/TPL–1 front end, removing right wheel assembly	33
46	Right wheel assembly removed	34
47	Removing left wheel assembly	34
48	Left wheel assembly removed	34
49	Removing antenna guard	34
50	Pedestal AB–39/TPL–1, base	34
51	Rotating head, top of pedestal column	35
52	Radar Set AN/TPL–1, right end view	35
53	Radar Set AN/TPL–1, left end view	36
54	Attaching tent poles	36
55	Tent, with fly, rear view	37
56	Section of circuit breaker panel	38
57	Starting procedure, step No. 1	38
58	Starting procedure, step No. 2	39
59	Starting procedure, step No. 3	39
60	Starting procedure, step No. 4	40
61	Starting procedure, step No. 5	40
62	Starting procedure, steps Nos. 5 and 6, NOTE	41
63	Starting procedure, step No. 6	41
64	Main Drive Assembly MX–186/TPL–1, and Range Indicator Unit ID–81/TPL–1	42
65	Range and PPI scope adjustments	43
66	PPI scope, mechanical adjustments	44
67	Tracking Indicator ID–82/TPL–1, adjustments	44
68	Receiver and synchronizer adjustments	45
69	View through left top handhole	46
70	Elevation sector cams and oil gauge	46
71	Typical pattern on PPI scope	47
72	Typical pattern on range scope	48
73	Typical patterns on tracking indicators	48
74	Front of log sheet	62
75	Back of log sheet	64
76	Azimuth and elevation selsyns	68
77	Selsyn controls, left side of pedestal	68
78	Selsyn controls, right side of pedestal	69
79	Center section of cabinet, panel removed, rear view	71
80	Coaxial lines and rotating joint	72
81	Top of pedestal, cover plate removed, rear view	72

DESTRUCTION NOTICE

WHY — To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN — When ordered by your commander.

HOW — 1. Smash — Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut — Use axes, handaxes, machetes.

3. Burn — Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives — Use firearms, grenades, TNT.

5. Disposal — Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT — 1. Smash — Magnetrons, klystron, all indicators, receiver, synchronizer, preamplifier, crystal mixer, dipole, gearing, and all tubes.

2. Cut — Tires, all transmission lines, and component interconnections.

3. Burn — Everything. Saturate thoroughly with gasoline.

4. Bend — Paraboloid and all mechanical parts.

5. Bury or scatter — Pieces of magnetron and klystron, crystal mixer, and coaxial cables after destroying their usefulness.

DESTROY EVERYTHING

WARNING

HIGH VOLTAGE
is used in the operation
of this equipment.

DEATH ON CONTACT
may result if personnel fail
to observe safety precautions.

Be careful not to contact high-voltage connections or 115-volt a-c input connections when installing or operating this equipment.

Before working inside the equipment, after the power has been turned off, always short-circuit the high-voltage capacitors.

EXTREMELY DANGEROUS POTENTIALS
exist in the following units:

Modulator MD–31/TPL–1
Pulse Transformer MX–187/TPL–1
Rectifier Power Unit PP–88/TPL–1
Range Indicator Unit ID–81/TPL–1
Tracking Indicator ID–82/TPL–1
Radar Receiver R–85/TPL–1

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FIRST AID TREATMENT FOR ELECTRIC SHOCK

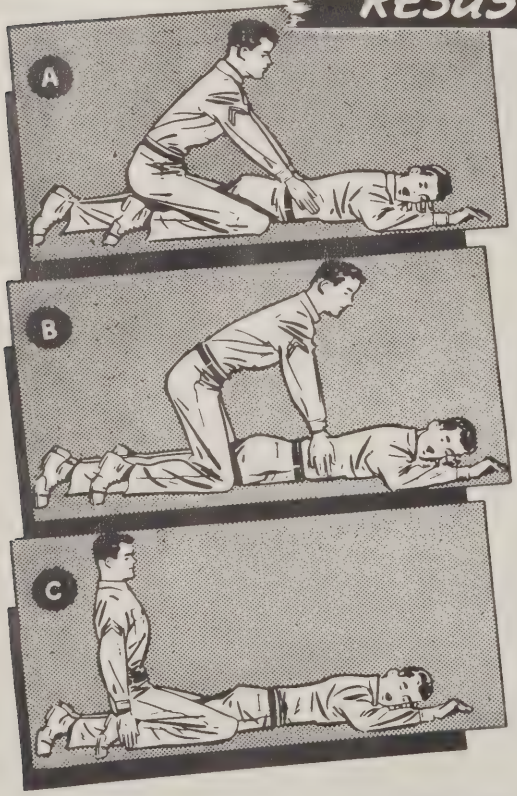
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

Shut off the current. If this is not immediately possible, use a dry nonconductor (rubber gloves, rope, board) to move either the victim or the wire. Avoid contact with the victim. If necessary to cut a live wire, use an axe with a dry wooden handle. Beware of the resulting flash.

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING.

Begin resuscitation at once on the spot. Do not stop to loosen the victim's clothing. Every moment counts. Keep the patient warm. Wrap him in any covering available. Send for a doctor. Remove false teeth or other obstructions from the victim's mouth.

RESUSCITATION



POSITION

1. Lay the victim on his belly, one arm extended directly overhead, the other arm bent at the elbow, the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing (fig. A).

2. Straddle the patient's thighs, or one leg, with your knees placed far enough from his hip bones to allow you to assume the position shown in figure A.

3. Place your hands, with thumbs and fingers in a natural position, so that your palms are on the small of his back, and your little fingers just touch his lowest ribs (fig. A).

FIRST MOVEMENT

4. With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the victim. Your shoulders should be directly over the heels of your hands at the end of the forward swing (fig. B). Do not bend your elbows. The first movement should take about 2 seconds.

SECOND MOVEMENT

5. Now immediately swing backward, to remove the pressure completely (fig. C).

6. After 2 seconds, swing forward again. Repeat this pressure-and-release cycle 12 to 15 times a minute. A complete cycle should require 4 or 5 seconds.

CONTINUED TREATMENT

7. Continue treatment until breathing is restored or until there is no hope of the victim's recovery. Do not give up easily. Remember that at times the process must be kept up for hours.

8. During artificial respiration, have someone loosen the victim's clothing. Wrap the victim warmly; apply hot bricks, stones, etc. Do not give the victim liquids until he is fully conscious. If the victim must be moved, keep up treatment while he is being moved.

9. At the first sign of breathing, withhold artificial respiration. If natural breathing does not continue, immediately resume artificial respiration.

10. If operators must be changed, the relief operator kneels behind the person giving artificial respiration. The relief takes the operator's place as the original operator releases the pressure.

11. Do not allow the revived patient to sit or stand. Keep him quiet. Give hot coffee or tea, or other internal stimulants.

HOLD RESUSCITATION DRILLS REGULARLY

REFERENCE NOTICE

TM 11–1352, TECHNICAL OPERATION MANUAL, is one of three technical manuals on Radar Set AN/TPL–1. It is used in conjunction with TM 11–1452, PREVENTIVE MAINTENANCE MANUAL, and TM 11–1552, SERVICE MANUAL. This manual, TM 11–1352, includes a general description of the radar set, and instructions for installation, operation, and use of the equipment performance log. It is intended that this manual will acquaint radar operators and radar repairmen with the general operating features of the equipment and provide a practical guide on how to use it. This book is an introduction to the set and forms the basis for further study and work with the equipment.

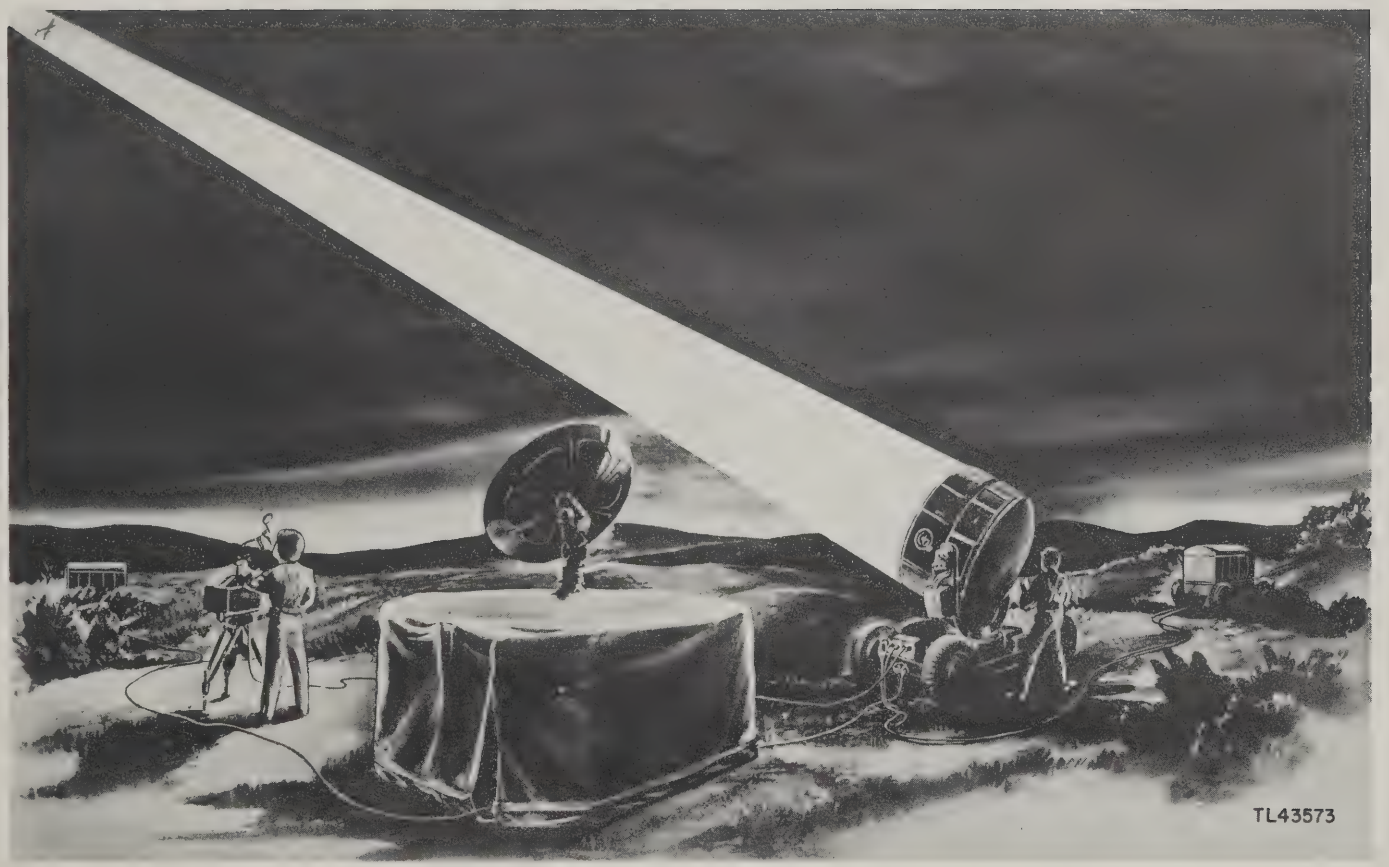


Figure 1. Radar Set AN/TPL–1.

This manual, together with TM 11–1452 and TM 11–1552, supersedes TM 11–1152, 10 March 1944.

CHAPTER 1
GENERAL DESCRIPTION

SECTION I
PURPOSE AND FUNCTIONING OF RADAR SET AN/TPL-1

1. PURPOSE.

Radar Set AN/TPL–1 (fig. 2) is a mobile, compact, lightweight radar unit designed for use with an antiaircraft searchlight. In all conditions of normal operation the unit will be carefully sited and accurately oriented. If desired, however, the unit may be used to give indications of approaching aircraft when the equipment is being transported in convoy. The general functions of the equipment are as follows:

a. To search the sky for enemy aircraft and, when found, to indicate their position. Position data is furnished as slant range (distance in yards) and as azimuth and elevation (angular directions in mils). The radar set also computes target altitude in feet. The altitude may be measured with either the radar set or sea level as the reference. The maximum slant range of the equipment is 60,000 yards.

b. To furnish target-position data to an antiaircraft searchlight so that the beam of the searchlight, when it is turned on, will strike the target.

c. To search for a second target while the searchlight follows the original target.

2. TYPE OF TARGET INFORMATION.

The equipment supplies azimuth and angle of elevation data to the searchlight. In addition, angle of elevation, altitude, slant range, and azimuth may be read from the dials.

a. Meaning of Azimuth. As shown in figure 3, the azimuth (or azimuth angle) of a target is its horizontal clockwise direction with respect to a specified reference direction. In the figure, the angle between ON and OB is the amount that the antenna has been turned horizontally from true north in order to point at the target in azimuth. This angle is the azimuth of the target, and is expressed in mils. (One degree equals 17.77 mils.)

b. Meaning of Slant Range. The slant range of a target is the direct distance between the target and the radar unit. In figure 4, slant range is indicated by the length of the bracketed line.

c. Meaning of Elevation Angle. A target's angle of elevation is the number of mils (or degrees) that the antenna is tilted above or below horizontal when it is pointed straight at the target. In figure 5, line OD is horizontal. Line OC leads straight from the radar unit to the target. The angle between the two lines is the elevation angle of the target.

d. Meaning of Altitude. As shown in figure 6, the altitude of a target is its height above the horizontal level of the radar set (if desired, above sea level). In the figure, the horizontal line OD is level with the set. The altitude of the target is represented by the length of the line DF.

3. RANGE DETERMINATION.

In Radar Set AN/TPL–1, as in other radar units, the slant range to a target is determined by converting time into distance. The time involved is that required for a radio signal (main pulse) to leave the transmitting antenna, travel to the target, be reflected from the target, and return (as an echo) to the receiving equipment. The changeover from time to distance is possible because the velocity of radio waves is constant and has been measured. Actual calculations of slant range by radar operators are made by having a picture of the main pulse and of the target echo appear on the calibrated screen of a cathode-ray tube. The echo of the main pulse appears at a point along the scale which corresponds to the slant range of the target (fig. 7).

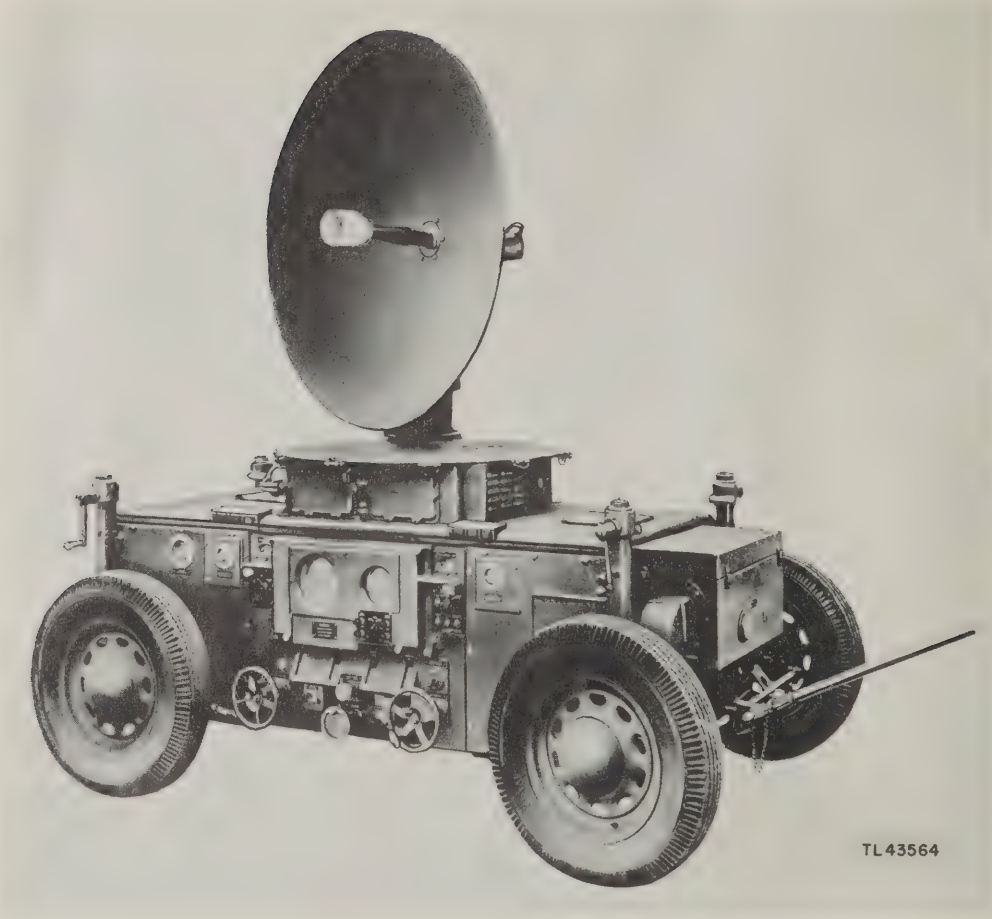


Figure 2. Radar Set AN/TPL–1, front and right end.

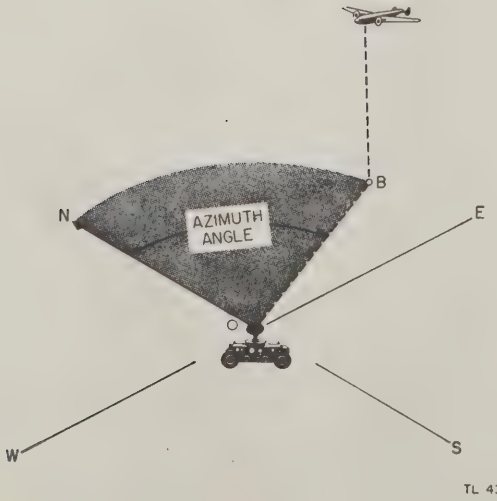


Figure 3. Determining azimuth angle of a target.

4. SCANNING IN AZIMUTH.

The two functions of Radar Set AN/TPL–1 are to give indications of approaching aircraft within a range of approximately 60,000 yards, and to provide accurate position data on nearby targets.

a. Scanning is the examination of space with radio waves sent out from the antenna of the radar unit (fig. 8). If a target, such as an airplane, is in the path of the waves and less than approximately 35 miles away, its presence will be detected.

b. In scanning or searching through 6,400 mils (360 degrees) in azimuth, the antenna describes a circle, completing about seven revolutions a minute. Since the speed of radio waves is so much greater than the speed with which the antenna rotates, it is possible for a radio wave to leave the antenna, go out to a target, be reflected, and return to the antenna before the antenna has had time to turn appreciably

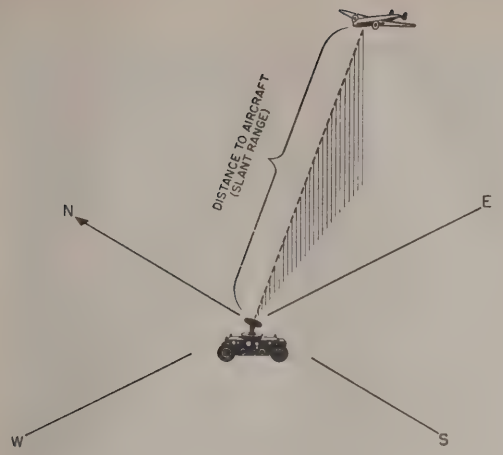


Figure 4. Determining slant range of a target TL 43505

away from the direction of the target. By ascertaining the direction in which the antenna is pointing, the azimuth of the target is obtained.

c. The equipment may be adjusted to search (scan) automatically or to search manually in azimuth. The change from manual to automatic search is made quickly and easily.

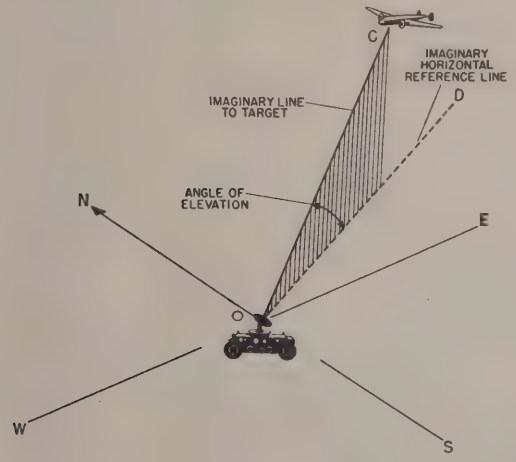


Figure 5. Determining elevation angle of a target. TL 43502

5. SCANNING IN ELEVATION.

While the radar set is scanning in azimuth, it can also be made to scan in elevation, that is, in an up-and-down direction. Scanning in elevation can be done either manually or automatically.

a. When controlled manually, the tilting of the antenna is continuous from minus 100 mils up to 1,600 mils elevation. The radar operator merely moves the elevation handwheel according to the data given by the presentation system of the radar set, in order to position the antenna in elevation.

b. When scanning automatically, the antenna is

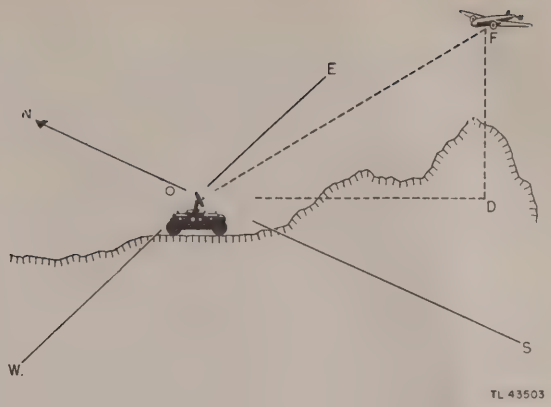


Figure 6. Determining altitude of a target.

tilted up and down so that a desired sector will be covered. The width of the sector described by the antenna axis can be selected between the limits of 125 mils and 825 mils in steps of 100 mils. The lower mechanical limit of the scanning sector can be set at minus 50 mils or at any 100-mil interval

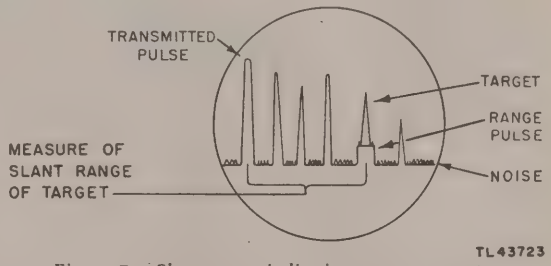


Figure 7. Slant range indication on range scope.

between 0 mils and 700 mils. Zero mils represents a horizontal direction in elevation.

(1) Referring to figure 9, assume that the lower-limit cam has been set at 0 mils elevation. The radio waves sent out from the radar antenna are, at 0 mils elevation, parallel to the imaginary horizontal reference line, OA. When the radar set is switched into automatic search, the antenna begins to rotate in azimuth and to move upward in elevation at the same time. After a single revolution assume that the

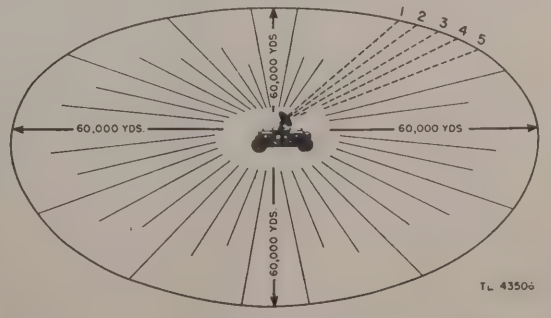


Figure 8. Scanning in azimuth with Radar Set AN/TPL–1.

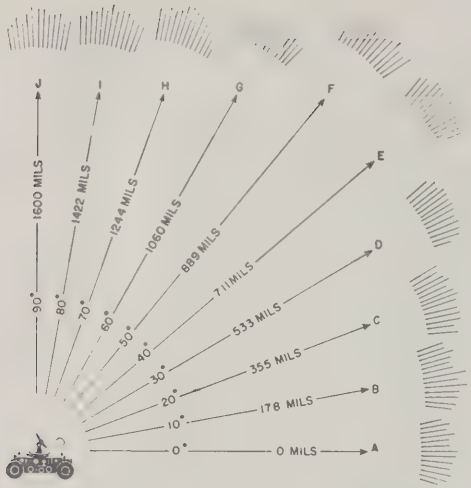


Figure 9. Scanning in elevation with Radar Set AN/TPL–1.

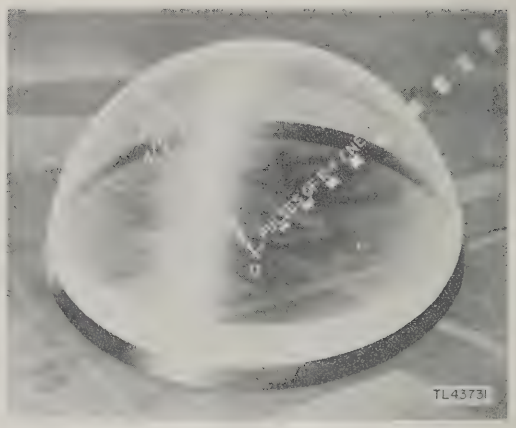


Figure 10. Scanning in azimuth and elevation.

antenna is directed upward at an angle of about 178 mils (10 degrees) above OA. The antenna is now sending out radio waves parallel to a second imaginary line, OB. Elevation of the antenna continues with each revolution in azimuth until the antenna points upward at that angle determined by the setting of the sector-width cam. Upon reaching that angle in elevation, the antenna reverses its direction and moves downward until it reaches the reference position of 0 mils.

(2) Referring to figure 10, assume that the radar operator desires to scan the 225-mil sector between 200 mils and 425 mils (OL to OM) all the way around the horizon. The lower-limit cam would be set at 200 mils and the sector-width cam at 225 mils. In automatic scan the radar antenna would tilt upward to 425 mils, then automatically return to the reference position of 200 mils, and then tilt upward again.

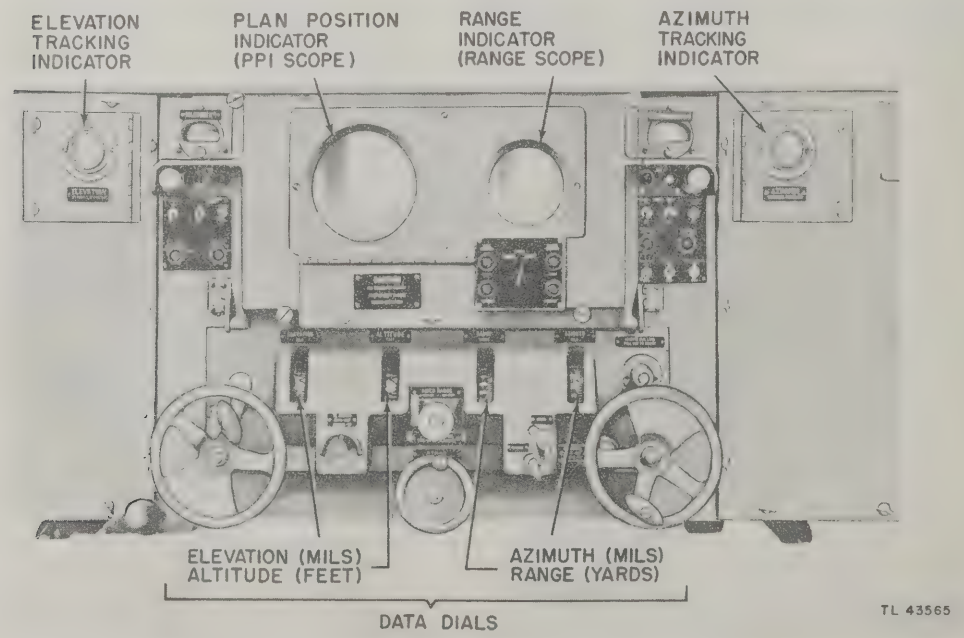


Figure 11. Information indicators.

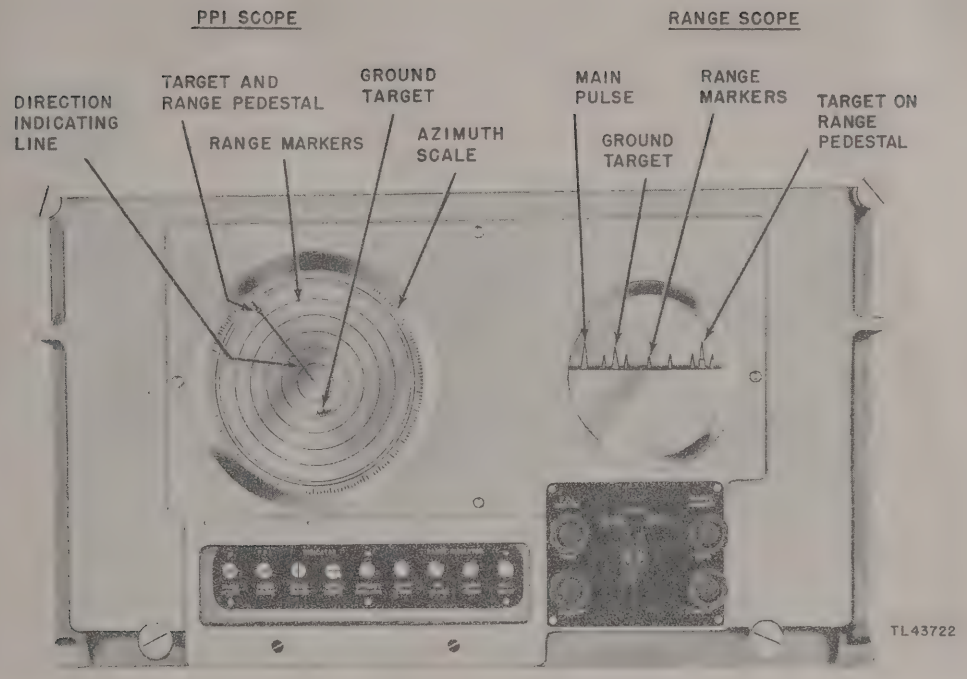


Figure 12. PPI and range scope presentation.

6. TARGET-INFORMATION INDICATORS.

Radar Set AN/TPL–1 employs the eight target-data indicators shown in figure 11. These consist of four cathode-ray tubes or oscilloscopes, and four dials. The four scopes include the plan-position indicator, the range scope (A–scope), and two tracking indicators (one for azimuth and one for elevation).

a. Plan-position Indicator. The plan-position indicator (PPI) scope is the largest of the four scopes and can be considered as the searching indicator for all targets located within the 60,000-yard range of the radar set. This cathode-ray tube provides an approximate indication of target range and azimuth, whereas the range oscilloscope (to be described later) makes accurate range data possible (fig. 12).

(1) DIRECTION INDICATING LINE. During operation, a line of bright light extends from the center of the PPI scope screen toward the edge of the screen. As the antenna rotates in azimuth, the bright line rotates in synchronism with it. Thus, if the radar set is correctly oriented, the direction-indicating line (sweep trace) indicates, at any instant, the azimuth in which the antenna is pointing.

(2) TARGET ECHO. A target echo appears as a bright spot along the direction-indicating line. The *range* of the target is represented by the linear distance from the center of the screen out to the target echo. The direction in which the indicating line is pointing when passing through the target echo represents the *azimuth* of the target (fig. 12).

(3) AZIMUTH SCALE. Located around the edge of the PPI scope is a calibrated transparent scale (fig. 12) divided into 320 equal divisions. Each division represents an angle of 20 mils. It is from these markings that the radar operator determines the azimuth of a target. In front of this calibrated scale and overlaying the screen of the cathode-ray tube are two sheets of transparent plastic. By scratching the plastic surface of these overlays so as to form rectangular coordinates (grids) the most satisfactory tactical results are obtained for a given location.

(4) RANGE MARKERS. As previously mentioned, the range of a target is represented by the distance from the center of the scope screen to the target echo. In Radar Set AN/TPL–1, this distance (range) can be gauged by means of a series of concentric circles of bright light on the PPI scope (fig. 12) known as "range markers". These circles of light, the centers of which are at the center of the screen (zero range), have a 10,000-yard radial distance established between them. By closing a switch,

849759 O - 49 - 3

the operator allows either three or six range-marker circles to appear on the scope screen, and then determines the approximate range of the echo by noting its position with relation to the concentric markers. Thus, the bright spot located midway between the fifth and sixth rings would represent a target at a range of 55,000 yards. The position of the target echo can also be read with relation to the rectangular coordinates on the transparent disks.

b. Range Scope. The range scope, a five-inch cathode-ray tube (fig. 12), is located beside the PPI scope, and its function is to provide range data as well as identification information when IFF equipment is used.

(1) SWEEP TRACE. The sweep trace appears on the range scope as a horizontal line across the center of the screen. At the extreme left end of the sweep trace a tall vertical "pip" extends upward from the trace. This pip represents the transmitter pulse of the radar set.

(2) TARGET ECHO. A target echo appears on the screen as a vertical pip extending upward from the sweep trace (fig. 12). The range of the target is represented by the distance between the target pip and the transmitter-pulse pip on the sweep trace.

(3) RANGE MARKERS. The range of a target is determined on the PPI scope by means of equally-spaced circles of bright light. To determine the range of a target on the range scope, however, short, vertical pips extending upward from the sweep trace (fig. 12) are used. Spaced equally along the trace, the distance between the marker pips is again 10,000 yards. Either three or six marker pips may be used on the range scope.

(4) RANGE PEDESTAL. The range pedestal consists of a small rectangular pulse extending upward from the sweep trace (fig. 12). It can be moved electrically from one end of the trace to the other at the will of the operator.

c. Tracking Indicators. The third and fourth cathode-ray tubes are the ELEVATION and AZIMUTH TRACKING INDICATORS (fig. 11). They are used to make possible the presentation of accurate azimuth and elevation data. This data is presented on the calibrated data dials, and is used to position the searchlight.

d. Data Dials. Four dials on the front of the radar set provide accurate target data which can be used in the radar plotting room (fig. 11). From left to right they are arranged as follows: the ELEVATION dial, the ALTITUDE dial, the RANGE dial, and the AZIMUTH dial.

SECTION II
COMPONENTS OF THE EQUIPMENT

7. GENERAL DESCRIPTION.

The components of Radar Set AN/TPL–1 are listed in table I (par. 40). Console Cabinet CY–153/TPL–1, Antenna Assembly AS–113/TPL–1, and Pedestal AB–39/TPL–1 contain all of the radar components of the set. The cabinet is the main unit, all other components being contained in it or mounted on it as shown in figure 13.

a. The cabinet is mounted on four wheels (fig. 2), which are removed when the set is in an operating position. These wheels permit rolling the set out of and into the transporting trailer. The cabinet is not spring supported upon the wheels and therefore, must NOT be towed on its own wheels by another vehicle.

b. The power unit, PU–35/U, is a separate unit transported in the truck that tows the trailer containing the radar set.

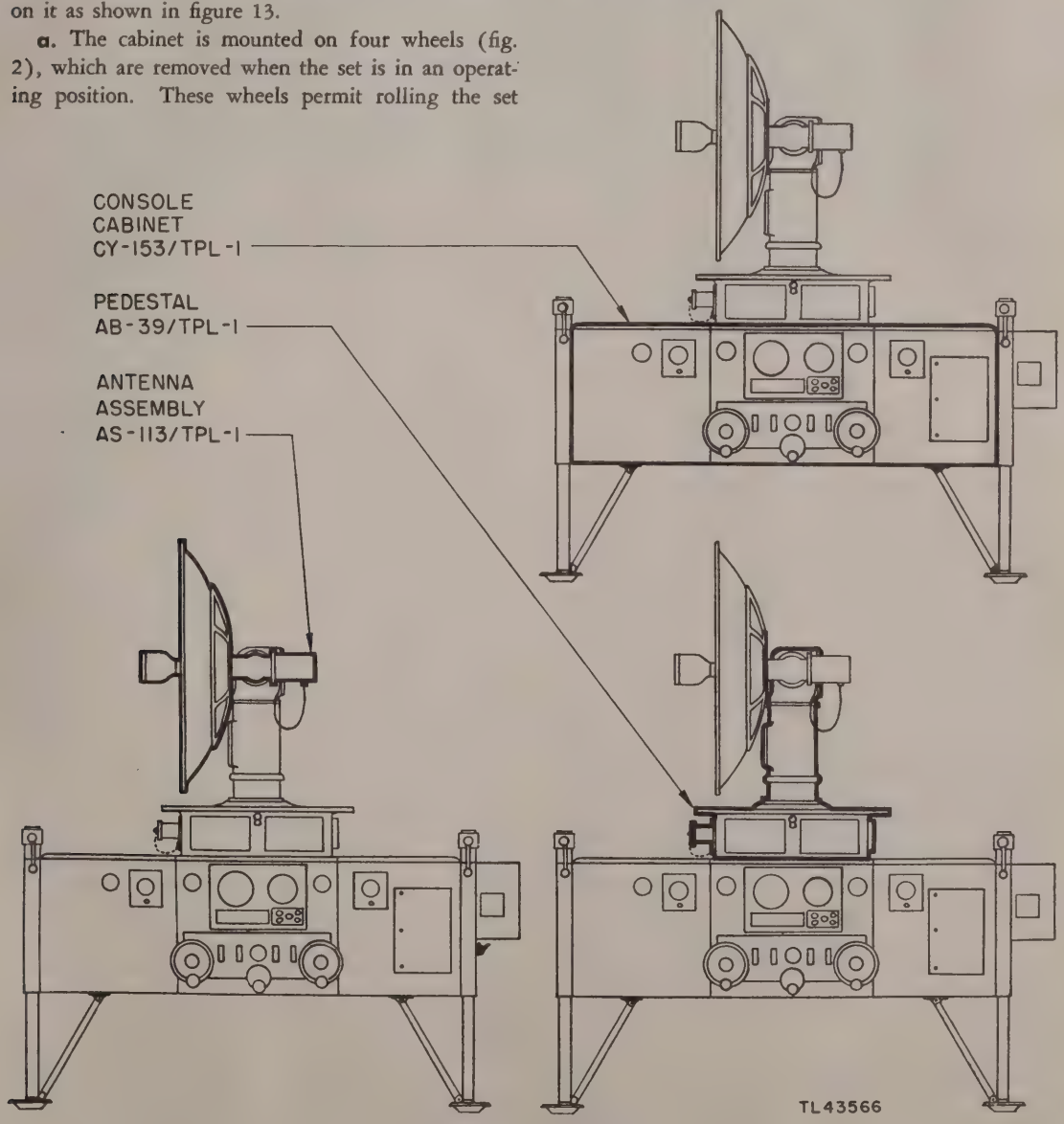


Figure 13. Antenna, pedestal, and cabinet break-down.

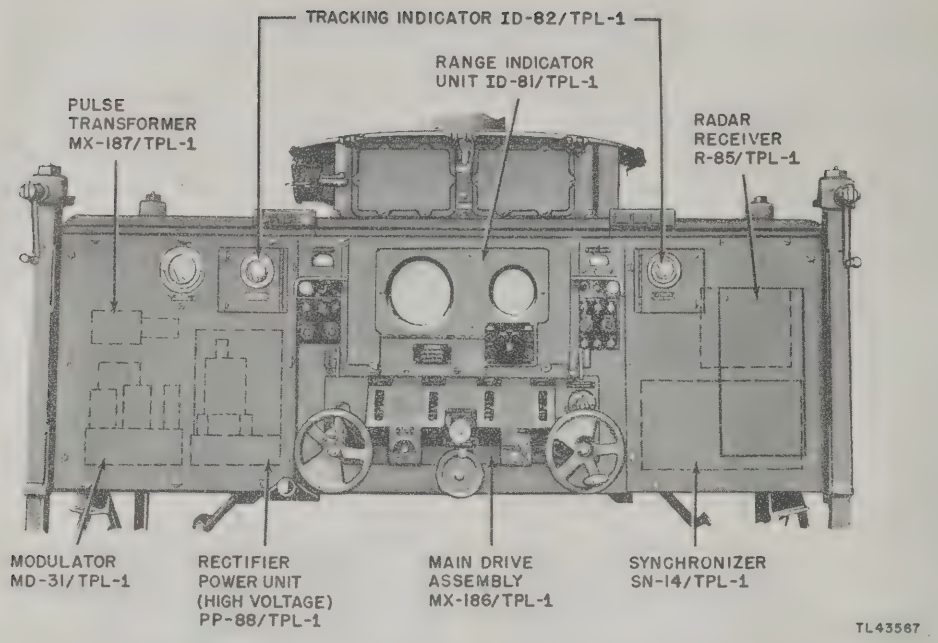


Figure 14. Front of cabinet, component location.

c. Under operating conditions the equipment is enclosed in a tent which gives protection against both adverse weather and insects. It also allows operation under blackout conditions and provides darkness for ease in reading the indicators. The tent encloses the radar set completely except for the pedestal column and those parts supported by the column (fig. 55). The headroom within the tent is about five feet.

8. CONSOLE CABINET CY–153/TPL–1 (figs. 14 and 16).

The console cabinet houses all the electrical chassis and the principal mechanical components of the set. In general, the right-end section contains the receiving components, the center section the indicating components and the left-end section the transmitting components. The console cabinet with front and rear panels removed is shown in figures 15 and 17.

a. General. The console cabinet is a metal box approximately 33 inches wide, 25 inches high and 80 inches long.

(1) Four extension jacks are permanently fixed to the cabinet, one at each corner. The cabinet rests upon the jacks when in operating position. When the jacks are fully extended the clearance between the ground and the bottom of the cabinet is 23 inches.

(2) Two removable wheel assemblies are attached to the cabinet, one at each end. The wheels are rubber-tired, automobile-type units (figs. 46 and 48). The wheel assembly at the right end of the cabinet has a steering bar to assist in loading and unloading the set from the trailer. Mechanical connections between the cabinet and each wheel assembly are designed for quick and easy installation and removal.

b. Right-end Section. The right end of the cabinet contains Radar Receiver R–85/TPL–1, Synchronizer SN–14/TPL–1, Azimuth Tracking Indicator ID–82/TPL–1 (fig. 14), and the circuit breaker panel (fig. 16).

(1) The right-end panel of the cabinet has three electrical receptacles. One receptacle provides a connection for auxiliary equipment (IFF) (fig. 52), and the other two are convenience outlets which provide power for the blower motors in the ventilation assembly, and for general purposes.

(2) The front panel of the right-end section of the cabinet consists of a removable cover plate provided with two doors (fig. 14). The door on the left has a window that permits observation of Azimuth Tracking Indicator ID–82/TPL–1. The other door gives access to operating controls on Radar Receiver

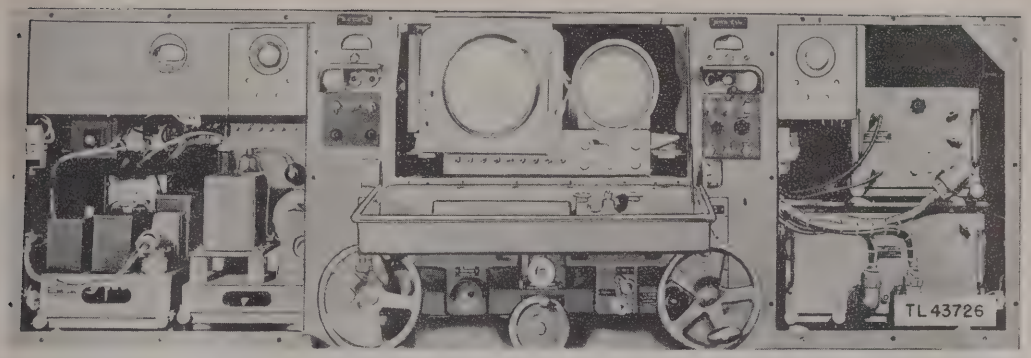


Figure 15. Front of cabinet, panels removed.

R–85/TPL–1 and Synchronizer SN–14/TPL–1.

(3) The back panel of the right-end section of the cabinet is a removable cover plate (fig. 16). The plate must be removed to reach the circuit breaker panel (figs. 17 and 32).

(4) Ventilation Assembly MX–231/TPL–1 is a rectangular box supported on the right-end panel of the cabinet (fig. 52). The ventilation assembly includes two blowers that draw air from a duct through the side of the tent. The air is passed through a filter and expelled into the interior of the tent.

c. Center Section. The center section of the cabinet contains Range Indicator Unit ID–81/TPL–1 and Main Drive Assembly MX–186/TPL–1 (figs. 14 and 15).

(1) The range indicator unit consists of two oscilloscopes, the PPI scope mounted on the left side, and the range scope mounted on the right side (fig. 26). The viewing screens of these scopes are visible behind windows installed in a separate cover plate hinged to the cabinet. A door on this cover plate gives access to several screwdriver adjustments (fig. 65). The range selector switch and those controls that vary the focus and intensity of the images presented on the scope screens are mounted on a small panel on the cover plate (fig. 65).

(2) The main drive is located beneath the range indicator unit, and the operating handwheels and controls of the main drive project through the front of the cabinet (fig. 14). The ELEVATION handwheel is at the left, the RANGE handwheel is in the center, and the AZIMUTH handwheel is at the right (fig. 28). The four data dials, which indicate the data furnished by the radar set, appear behind windows on the front of the cabinet. From left to right they indicate target elevation, altitude, range, and azimuth (fig. 28).

(3) Two meters are mounted in the upper left- and right-hand corners of the front panel. The meter on the left side, the H.V. CURRENT meter, gives an indication of the power transmitted by the set (figs. 33 and 34). The meter on the right side, the CRYSTAL CURRENT meter, is used in observing the operation of the receiver system (figs. 33 and 35).

(4) On the left control panel below the H.V. CURRENT meter are mounted an overload RESET switch, two TRANSMITTER POWER switches, a P.P.I. SCALE DIM-BRIGHT control, and a P.P.I. GRID DIM-BRIGHT control (fig. 34). On a similar panel located below the CRYSTAL CURRENT meter, are mounted the two main POWER switches and the panel LIGHTS switch, the RECEIVER GAIN control and the I.F.F. GAIN control; and the MARKER, BUZZER, and CHALLENGE switches (fig. 35).

(5) The rear cover plate of the center section has a door in its lower right corner. This door gives access to the elevation scan adjustments (figs. 17 and 70). The top of the center section of the cabinet supports the antenna pedestal.

d. Left-end Section. The left-end section is divided internally by a shelf. The components mounted on the shelf include the T/R box, the crystal mixer, the transmitter oscillator (magnetron), the blower for the transmitter oscillator, the horizontal section of the transmission line, and Pre-Amplifier AM–42/TPL–1 (figs. 16 and 17). Mounted beneath the shelf are Modulator MD–31/TPL–1, Rectifier Power Unit (high voltage) PP–88/TPL–1, Rectifier Power Unit (low voltage) PP–89/TPL–1, Pulse Transformer MX–187/TPL–1, and the modulator blower (figs. 14, 15, 16, and 17). On the front panel and near the top are located the line voltage meter and Elevation Tracking Indicator ID–82/TPL–1 (figs. 14 and 33).

(1) The left-end panel of this section has three electrical receptacles (fig. 53). The largest receptacle, in the lower left corner, is the input connector for the cable that leads from the power unit. All of

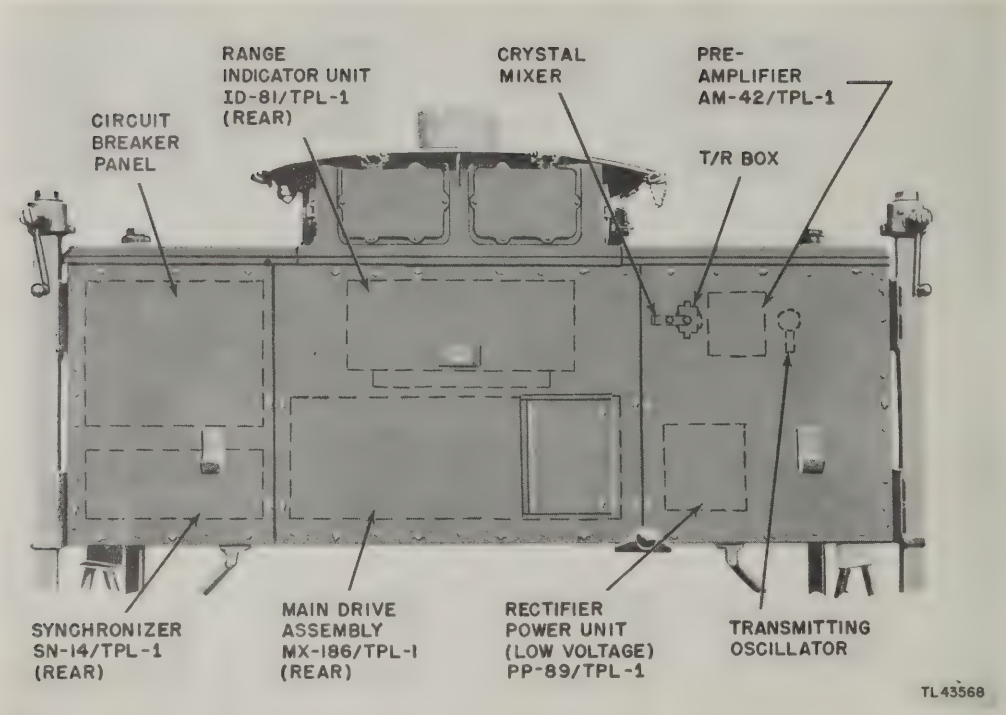


Figure 16. Rear of cabinet, component location.

the power necessary for the operation of the radar set is delivered to the cabinet through this receptacle. Two 115-volt 60-cycle convenience outlets are located in the lower right-hand corner of the panel. The nameplate for the radar set is on this panel.

(2) The front panel of the left-end section consists of a removable cover plate that has two openings (fig. 14). One opening is a window that permits reading a meter indicating the voltage supplied to the radar set by the power unit (fig. 33). A push button mounted on the panel makes it possible to read either 60-cycle or 400-cycle supply voltages on the meter. The second opening is a door, containing a window that permits observation of the elevation tracking indicator.

(3) The rear panel of this section is a removable cover plate that has no openings (fig. 16). The voltage to the pilot lamps in the cabinet can be adjusted by a control behind this panel (figs. 17 and 29).

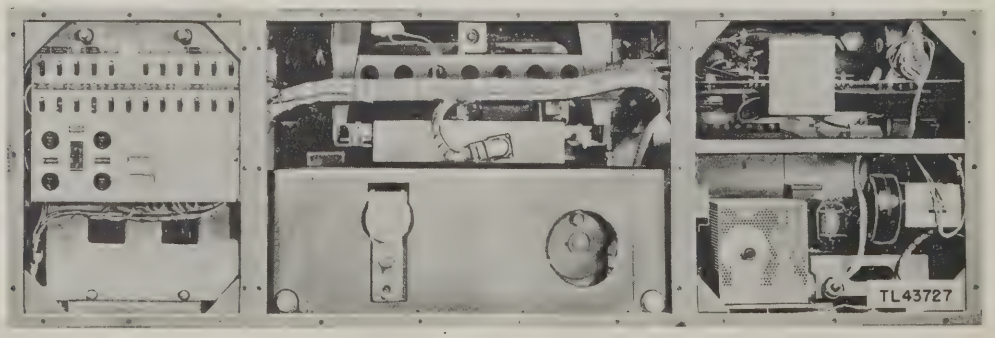


Figure 17. Rear of cabinet, panels removed.

9. PEDESTAL AB–39/TPL–1 (figs. 18, 19, and 20).

The pedestal is mounted on the top of the cabinet. It consists of a box-like base surmounted by a circular column which supports the antenna (fig. 19). The base contains the elevation and azimuth drive gearing, the selsyns (fig. 76) that send target-position data to the searchlight, and a blower motor that draws air from the interior of the set. The pedestal

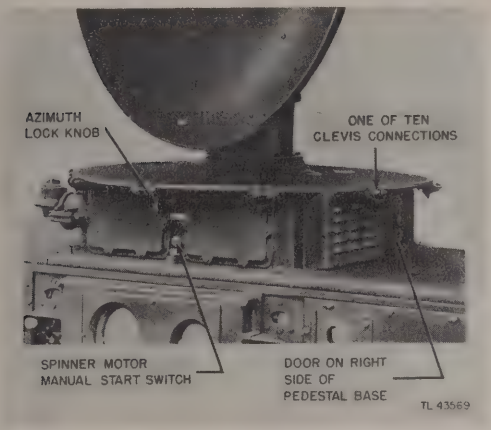


Figure 18. Pedestal base, front and right side.

contains numerous controls and switches, as well as the electrical and mechanical connections joining the antenna assembly to the console cabinet. The electrical connections include the coaxial line carrying the radar signals to and from the antenna, and the electrical leads to the antenna spinner motor (figs. 20 and 21). The mechanical components are the gearing and shafts that move the paraboloid in azimuth and elevation. The pedestal and the antenna can be removed from the console cabinet, reducing the height of the set by approximately five feet. This facilitates the transportation of the radar unit by airplane. The pedestal is not ordinarily removed, however, when the set is transported in its trailer.

a. Pedestal Base. The pedestal base is a square case approximately 33 inches on a side and 11 inches in height (figs. 18 and 19). The top of the base consists of a disk having a diameter equal to the diagonal of the square case. The disk serves as a "cat-walk" for the operators when adjusting the devices at the top of the pedestal. The edge of the disk is provided with ten clevis connections supporting the inner ends of the tent poles (fig. 18). On the sides of the pedestal base are cover plates, doors, two cable receptacles, and the azimuth lock knob (figs. 18 and 19).

(1) The AZIMUTH LOCK knob projects from the middle of the front of the pedestal base, just below the cat-walk (fig. 18). When it is pushed in, the handle locks the antenna at a fixed position in azimuth. The antenna can rotate freely when the handle is pulled out.

(2) The SPINNER MOTOR switch is also placed on the front of the pedestal base. This switch is used to control the starting of the antenna spinner motor under certain conditions.

(3) The data cable receptacles are mounted on the left side of the pedestal base (fig. 19). The larger receptacle accommodates the cable transferring data from the radar set to the searchlight. The smaller receptacle is for use only when the set is used for other purposes.

(4) A circular door on the left side of the pedestal base permits access to the elevation selsyn adjustments (figs. 19 and 76).

(5) A circular door on the right side of the base gives access to the azimuth selsyn adjustments and to two switches (fig. 18). The BLOWER switch controls the cabinet blower. The WINTER-SUMMER switch adjusts the spinner motor circuit for winter or summer conditions (fig. 30).

(6) The cover plate on the left side of the front of the pedestal base conceals the electrical plug connection for the pedestal. The cabinet blower motor

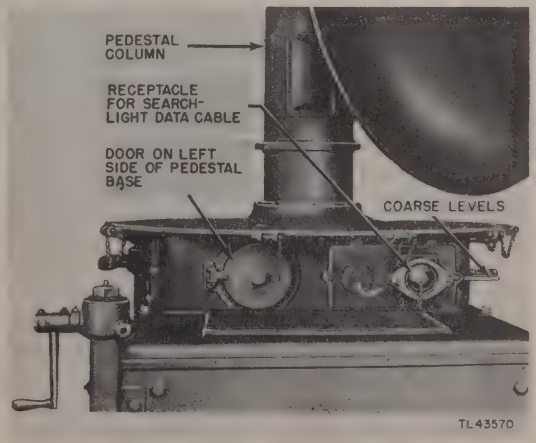


Figure 19. Pedestal base, left side.

is reached by removing the cover plate on the right side of the front of the base (fig. 18).

(7) By removing the cover plates on the back of the pedestal base the selsyns may be reached (fig. 76). These cover plates have two sets of gears attached to their inner surfaces. The gears are pro-

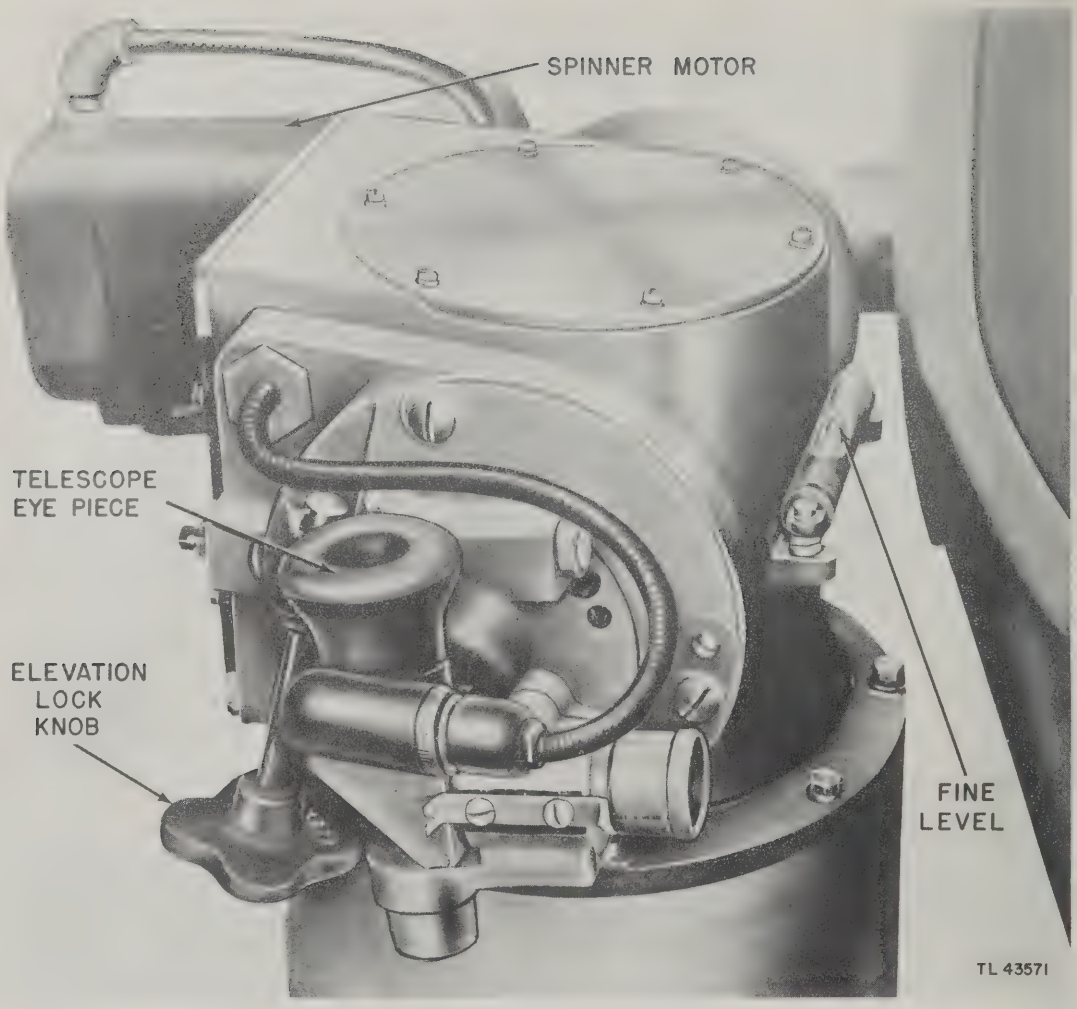


Figure 20. Pedestal column, top.

vided in the event that Radar Set AN/TPL–1 is used to supply data at a 16 to 1 ratio.

(8) Two bubble levels, at right angles to each other, are mounted on the front left corner of the pedestal base (fig. 19). They are used in the initial rough leveling of the radar set.

b. Pedestal Column. The pedestal column, mounted on top of the pedestal base, supports the antenna assembly. When the radar set is in an operating position, the column extends through a hole in the center of the tent (fig. 55). A canvas boot fastens the tent to the base of the column. Above the boot is a dropring to prevent rain from leaking down the column into the tent.

(1) The ELEVATION LOCK, mounted at the top of the pedestal column, has a small knob that adjusts the brake-band type lock (fig. 20). When the band is tightened, the antenna cannot move in elevation.

(2) A telescope, mounted at the top of the column, is used in orienting the radar set with the searchlight. A bubble level, also mounted on the top of the column, is used for accurately leveling the set (fig. 20).

10. ANTENNA ASSEMBLY AS–113/TPL–1 (fig. 21.)

The antenna assembly is attached to the top of the pedestal in such a manner that it can rotate in azimuth and tilt in elevation. The assembly includes the paraboloid, the antenna feed line and dipole, and the spinner motor (fig. 21).

a. Paraboloid. The paraboloid is a dish-shaped metal plate, 48 inches in diameter. The mechanical connections that direct its motion are carried up the inside of the column. A small hole, located about halfway between the center and the edge of the paraboloid, permits orientation of the radar set with the searchlight by means of the telescope.

b. Antenna. The antenna feed line is designed to rotate within a tubular housing. The feed line projects through the center of the paraboloid. The tubular feed-line housing is attached to the paraboloid. The antenna dipole, protected by a plastic cover, is mounted on the end of the feed line at the focus point of the paraboloid (fig. 21).

c. Spinner Motor. The spinner motor is located at the top of the pedestal, and its shaft runs along the axis of the paraboloid (figs. 20 and 21). The motor rotates the antenna dipole at a high rate of speed. This motion should not be confused with the movement of the antenna and paraboloid in azimuth and elevation. Also enclosed in the spinner motor case is a two-phase, 100-cycle generator, the armature of which is on the same shaft as the motor armature. This generator provides voltages used in the synchronizer and the tracking indicators.

11. TENT (fig. 55).

The tent, made of water-proofed and mildew-proofed canvas, protects both operating personnel and the radar set from adverse weather conditions. It also permits operation under blackout conditions.

a. Designed with ten sides and a slightly sloping roof, the tent is supported at the center by the pedestal of the set. Ten pipe supports extend radially outward from the pedestal (fig. 54). These supports, which curve downward to the ground at their outer ends, provide a headroom within the tent of approximately five feet. Two doors, one in the side and one in the roof of the tent, are provided. The roof door allows personnel to reach the pedestal column and the paraboloid from the inside of the tent. Both doors are opened and closed by means of slide fasteners.

b. Ventilation Assembly MX–231/TPL–1 provides forced ventilation for the interior of the tent. The assembly is installed on the right end of the cabinet near the top, and consists of two blowers housed in a rectangular box (fig. 52). The intake of the assembly extends through the side of the tent when the set is in an operating position. The assembly filters the air that is drawn in and discharges it into the tent through two vents, one at each end of the unit. An electrical connection, supplying power to the ventilation blower motors, is located on the right-end panel of the cabinet (fig. 52).

c. A portable utility heater is provided to warm the interior of the tent in cold weather. Either gasoline or kerosene is used in the heater and the products of combustion are carried to the outside of the tent by a length of flexible tubing. A 115-volt 60-cycle cable supplies power from the set for the heater fan.

12. GROUPING OF COMPONENTS.

The equipment for Radar Set AN/TPL–1 may be divided into six groups: transmitting group, receiving group, indicating group, r–f group, control group, and test equipment. In some cases parts of

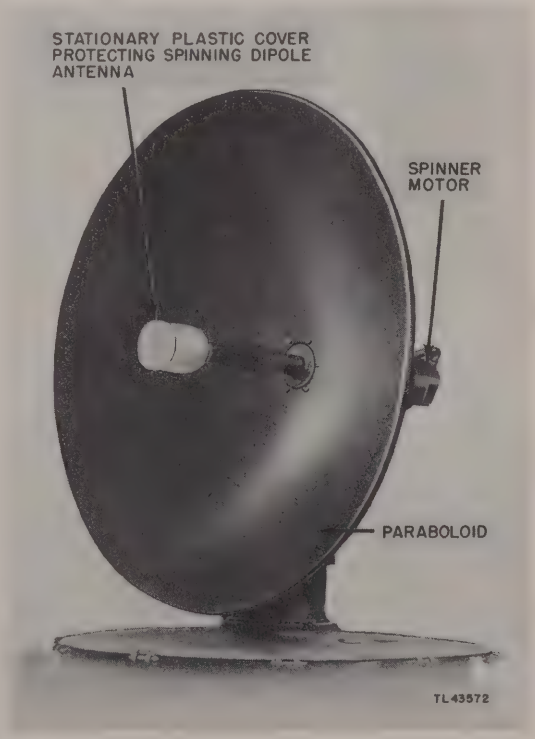


Figure 21. Antenna Assembly AS–113/TPL–1.

one group overlap those of another. This means that one chassis contains electrical circuits that belong to more than one group of components. A description of the functioning of each of these groups is contained in sections III through IX of this chapter. A complete discussion will be found in TM 11–1552. The grouping of components is as follows:

a. Transmitting Group.

(1) MODULATOR MD–31/TPL–1.

(2) RECTIFIER POWER UNIT (High Voltage) PP–88/TPL–1.

(3) PULSE TRANSFORMER MX–187/TPL–1.

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(4) TRANSMITTER OSCILLATOR.

b. Receiving Group.

(1) CRYSTAL MIXER.
(2) LOCAL OSCILLATOR.
(3) PRE-AMPLIFIER AM–42/TPL–1.
(4) RADAR RECEIVER R–85/TPL–1.

c. Indicating Group.

(1) SYNCHRONIZER SN–14/TPL–1.
(2) RANGE INDICATOR UNIT ID–81/TPL–1.
(3) TRACKING INDICATORS ID–82/TPL–1.
(4) MAIN DRIVE ASSEMBLY MX–186/TPL–1.
(5) RECTIFIER POWER UNIT (Low Voltage) PP–89/TPL–1.

d. R-f Group.

(1) R–F LINE.
(2) ANTENNA ASSEMBLY AS–113/TPL–1.
(3) T/R BOX.

e. Control Group.

(1) SWITCHES.
(2) CIRCUIT BREAKERS.
(3) METERS.
(4) HANDWHEELS AND KNOBS.
(5) SCREWDRIVER ADJUSTMENTS.
(6) OTHER TYPES.

f. Test Equipment.

(1) ANALYZER I–153.
(2) VOLTAGE DIVIDER TS–265/UP.
(3) OSCILLOSCOPE TS–34/AP.
(4) TEST SET I–157 (Vacuum Tube Checker).
(5) WAVEMETER TEST SET TS–117/GP.
(6) ECHO BOX TS–207/UP.
(7) DUMMY LOAD TS–279/UPM (for modulator).
(8) TEST SET TS–216/TPL–1 AND CABLES.
(9) SIGNAL GENERATOR WIT, MODEL 43-41.

SECTION III
TRANSMITTING GROUP

13. GENERAL.

The purpose of the transmitting group is to send bursts, or pulses, of high-frequency energy out into space at regular intervals, and in known directions. When the pulses strike a target they are reflected back to the equipment, and enter the receiving system.

14. MODULATOR MD–31/TPL–1.

This unit is located in the lower left-end section of Console Cabinet CY–153/TPL–1 (figs. 14 and 15). The modulator receives, from the synchronizer, timing pulses which it shapes, amplifies, and sends to Pulse Transformer MX–187/TPL–1.

15. RECTIFIER POWER UNIT PP–88/TPL–1.

The high-voltage power supply is located in the lower left-end section of the console cabinet (figs. 14 and 15). The supply steps up and rectifies an 115-volt a-c input and its output d-c voltage is applied to the modulator. When the modulator "fires", the resultant pulse is sent to the pulse transformer.

16. PULSE TRANSFORMER MX–187/TPL–1.

The pulse transformer is in the left-end section of the console cabinet (figs. 14 and 15). The transformer, a rectangular box with two stand-off insulators projecting from one side, receives the modulator pulse and increases its amplitude before applying it to the transmitter oscillator.

17. TRANSMITTER OSCILLATOR.

The transmitter oscillator tube is mounted on the shelf in the left-end section of the console cabinet (fig. 16). The filament connections of the tube extend downward through a hole in the shelf and are supplied with voltage from the pulse transformer. Also located on the shelf is the blower for the transmitter tube, and the output connection.

a. The oscillator is a metal vacuum tube with a set of cooling fins and glass seals on input and output leads.

b. The function of the transmitter oscillator is to convert the high-voltage pulse from the pulse transformer into high-frequency energy.

SECTION IV
RECEIVING GROUP

18. GENERAL.

The function of the receiving group is to convert the reflected energy picked up by the antenna into the proper form for application to the presentation system. First, the echo signals are mixed with the local oscillator output. The intermediate-frequency signals which result from this mixing are then amplified and detected. They are fed through the synchronizer to the presentation system where the information contained in the signals is visually presented on the PPI and range scopes.

19. CRYSTAL MIXER.

a. The crystal mixer is located on the shelf in the left-end section of the console cabinet, and is rigidly fixed to the T/R box (figs. 16 and 69). This assembly contains a small removable cartridge in which a detecting crystal has been sealed. A knurled adjusting screw is provided for changing the coupling to the local oscillator (fig. 69).

b. The echo signals are fed from the antenna to the crystal mixer through the T/R box. The signals are mixed with the local oscillator signal, and the resulting intermediate-frequency signal is sent to the preamplifier.

20. LOCAL OSCILLATOR.

The local oscillator is mounted on the chassis of Radar Receiver R–85/TPL–1 (fig. 22). The tuning

Figure 22. Local oscillator.

control of the oscillator extends through the front of the chassis, and the power supply for the tube is mounted on the right side of the chassis.

a. The local oscillator generates a continuous signal that is mixed (in the crystal mixer) with the reflected signals.

b. The operating adjustments on the local oscillator are made with the tuning knob, the REFLECTOR voltage control, and the GRID voltage control (fig. 68). The controls are adjusted through a door in the right-end front panel of the cabinet.

21. PRE-AMPLIFIER AM–42/TPL–1.

The preamplifier is mounted on the shelf in the left-end section of the console cabinet (figs. 16 and 17). The electrical circuits are enclosed in a rec-

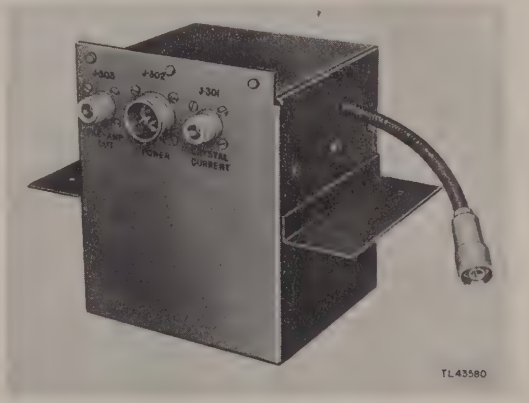

Figure 23. Pre-Amplifier AM–42/TPL–1.

tangular metal box, which has two jacks and a cable connector on one side of its sides (fig. 23). A short length of coaxial cable connects this unit to the crystal mixer. The preamplifier receives the signals from the crystal mixer, amplifies them, and then sends them to the receiver for further amplification.

22. RADAR RECEIVER R–85/TPL–1 (fig. 24).

The receiver is located in the upper right-end section of the console cabinet (figs. 14 and 15). The local oscillator is mounted near the front of the chassis (fig. 22). On the front panel of the chassis are three jacks, a cable connector, and the three local oscillator controls (fig. 24).

a. The receiver takes the signals from the preamplifier, amplifies and detects them, and sends them to the synchronizer as radar video signals.

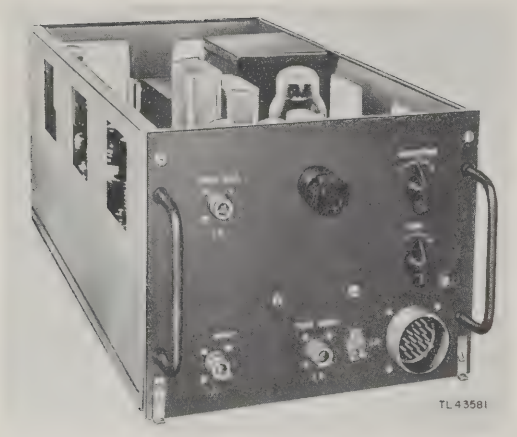

Figure 24. Radar Receiver R–85/TPL–1.

b. In addition to the controls for the local oscillator, an antijamming switch is mounted on the receiver front panel (fig. 24). When this switch is thrown into the ON position, the interference caused by jamming is reduced.

SECTION V
INDICATING GROUP

23. GENERAL.

The purpose of the indicating group is to convert electrical and mechanical data into a visual form that is usuable when observed on the data dials and oscilloscopes. The mechanical devices that position the antenna assembly are also contained in this group.

24. SYNCHRONIZER SN–14/TPL–1 (fig. 25).

The synchronizer consists of a large chassis located in the lower right-end section of the console cabinet (figs. 14 and 15). Located on the synchronizer panel are two cable connectors, a jack, a switch, and two control knobs (fig. 25). The latter three may be reached through a door in the front right-end panel of the cabinet (fig. 68).

a. Operation. The synchronizer has two signal inputs; first, the reflected radar video signal from the receiver, and second, the signal from the IFF unit. The reflected radar video signal is mixed with the range pedestal and may be mixed with the range marker signals, depending upon the setting of the range marker switch. The synchronizer sends video signals to the range scope, and gated radar video signals to the tracking indicators. The synchronizer controls the timing for the entire radar set by:

(1) Timing the transmitter trigger, the range markers, the PPI sweep, range scope unblanking, and the IFF trigger.
(2) Triggering the IFF transmitter.
(3) Unblanking the range scope during that time when the reflected signal is being received.
(4) Sending pulses to the range indicator unit. These pulses, or range markers, appear on both the PPI and range scopes.
(5) Supplying a pulse to the range indicator unit and the tracking indicators. This pulse or range pedestal appears on the range scope as a small rectangular pulse on the sweep trace and appears on the PPI as a bright spot on the trace (fig. 12). The range pedestal can be moved along the sweep trace by turning the RANGE handwheel, and, when properly positioned beneath a target echo on the range scope, causes the target echo to appear on the tracking indicators also.
(6) Supplying a varying voltage which is used to control the gain of the radar receiver.
(7) Providing timing signals which control the operation of the tracking indicators.
(8) Amplifying the IFF video signals.

b. Controls. Three operating controls are located

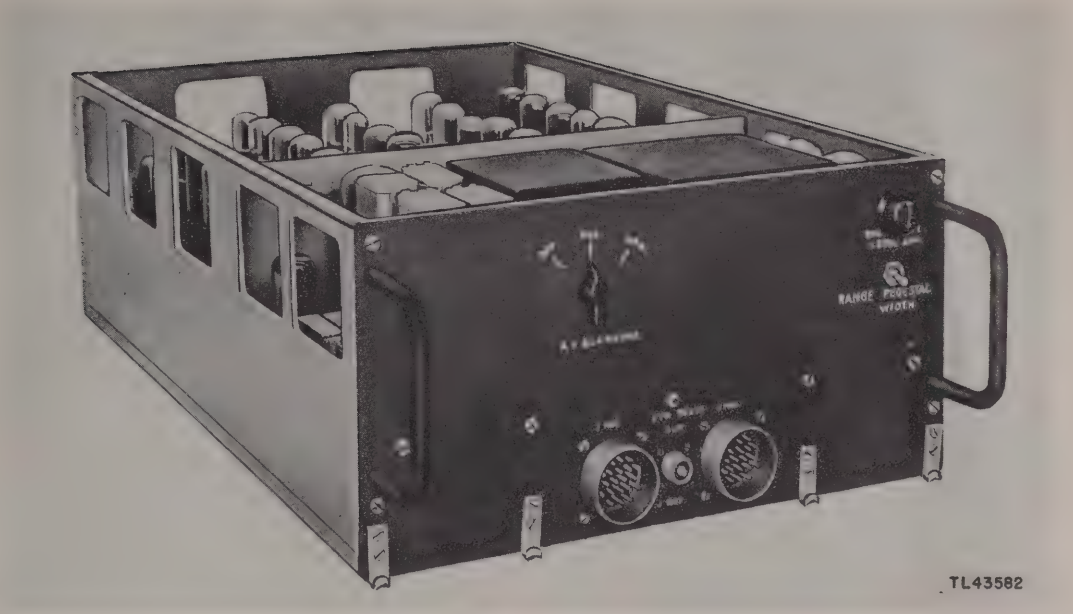

Figure 25. Synchronizer SN–14/TPL–1.

on the front of the chassis. The RANGE PEDESTAL WIDTH switch (fig. 68) permits the choice of two pedestal widths. The RANGE GATE LEVEL ADJ. knob (fig. 68) governs the range gate level. The A-J BLANKING switch (fig. 25) allows the use of circuits that reduce the effects of jamming.

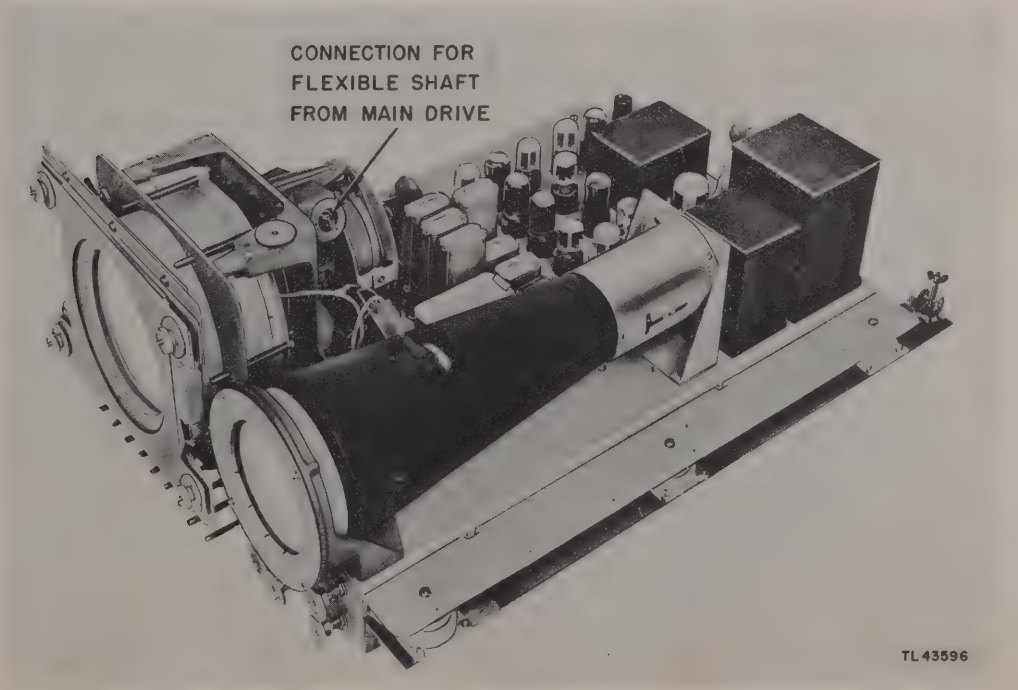

Figure 26. Range Indicator Unit ID–81/TPL–1.

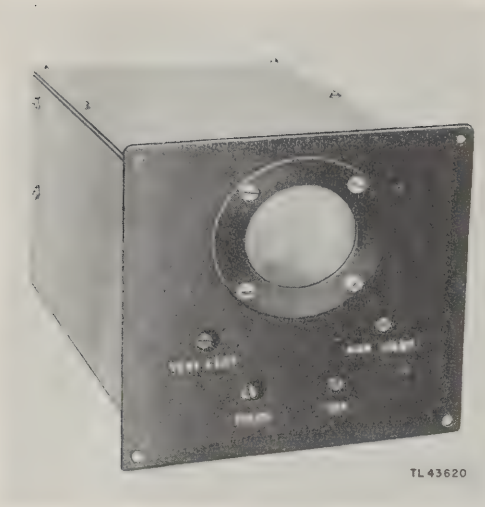

Figure 27. Tracking Indicator ID–82/TPL–1.

25. RANGE INDICATOR UNIT ID–81/TPL–1 (fig. 26).

The range indicator unit is in the upper center section of the console cabinet (figs. 14 and 15). Two oscilloscopes, the range and the PPI, together with their power supplies, are mounted on the chassis. The plan-position indicator (PPI) scope is a 7-inch cathode-ray tube, while the range scope is a 5-inch cathode-ray tube. A cable connector (fig. 79) on the rear of the chassis is used for all electrical connections. Rotation of the PPI deflection coil is accomplished by a flexible shaft connecting to the main drive assembly.

a. The range indicator unit receives the mixed radar video signals and the IFF video signals from the synchronizer. The radar signals are presented on the screens of both the PPI and range scopes, while the IFF signals appear on the range scope only.

b. On the front of the chassis are nine screwdriver adjustments and five control knobs (fig. 65). The former adjustments can be reached through a small door on the front panel, while the latter five controls are mounted on a small panel on the front of the cabinet.

26. TRACKING INDICATORS ID–82/TPL–1 (fig. 27).

The azimuth tracking indicator is mounted in the upper right-end section of the console cabinet. The elevation tracking indicator is mounted in the upper left-end section of the console cabinet (fig. 14). The scope screens are visible through two openings in the front of the cabinet. The two indicators, each with a 2-inch cathode-ray tube, are identical and can be interchanged.

a. When the operator ranges a selected target

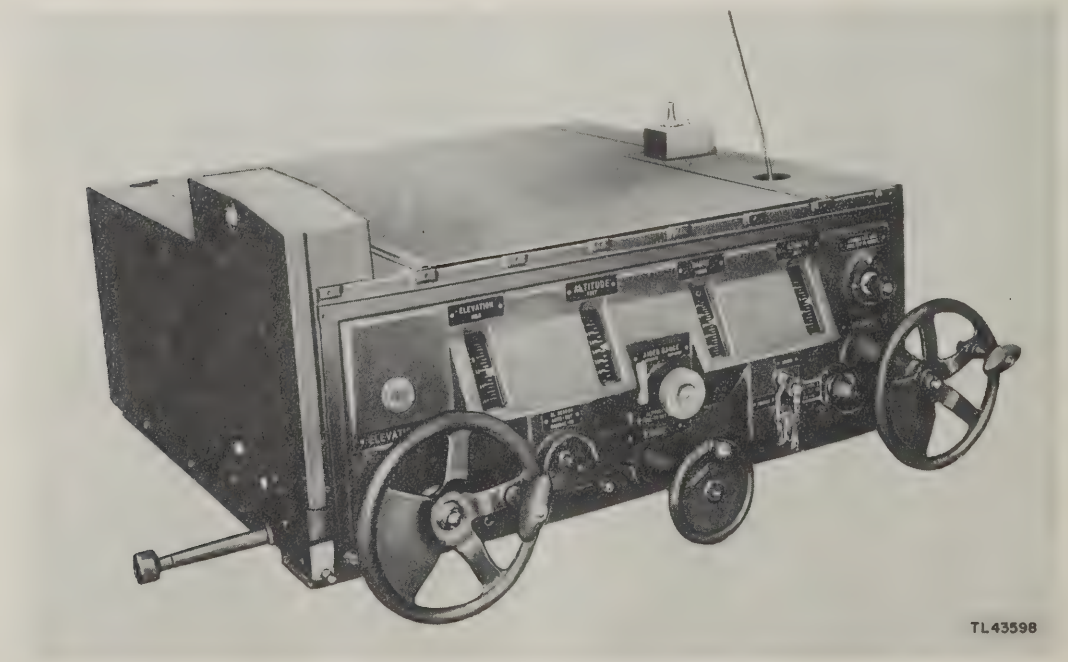

Figure 28. Main Drive Assembly MX–186/TPL–1.

echo (that is, places the range pedestal beneath the selected signal on the range scope), the tracking signal appears on the tracking indicators. Only the elevation signals appear on the elevation scope, and only the azimuth signals appear on the azimuth scope.

b. On the front of the tracking indicators are four screwdriver adjustments that control the positioning, intensity, and focus of the sweep traces (fig. 27). These adjustments may be made through doors in the front of the console cabinet (fig. 14).

27. MAIN DRIVE ASSEMBLY MX–186/TPL–1 (figs. 28 and 64).

The main drive assembly is in the lower center section of the console cabinet (figs. 14 and 15). The assembly consists of a cast-metal base, on which are mounted numerous mechanical and electrical components. The unit may be withdrawn from the rear of the cabinet (figs. 16 and 17).

a. In addition to the electrical connections, which are made through two cable connectors on the assembly, there are three other external connections.
(1) A flexible shaft (fig. 79) drives the rotating yoke on the PPI scope.
(2) A drive shaft (fig. 79) transmits azimuth motion to the antenna assembly.
(3) A second drive shaft (fig. 79) transmits elevation motion to the antenna assembly.

b. Turning the handwheels on the main drive positions the antenna, and at the same time supplies mechanical and electrical data to the data dials and scopes.

c. In addition to the four data dials (ELEVATION, ALTITUDE, RANGE, and AZIMUTH), there are ten operating controls on the front of the main drive assembly (figs. 28 and 64). These controls, from left to right are:
(1) ELEVATION handwheel.
(2) EL. SEARCH switch.
(3) ALTITUDE DIAL LOCK knob.
(4) AIDED RANGE knob.
(5) RANGE handwheel.

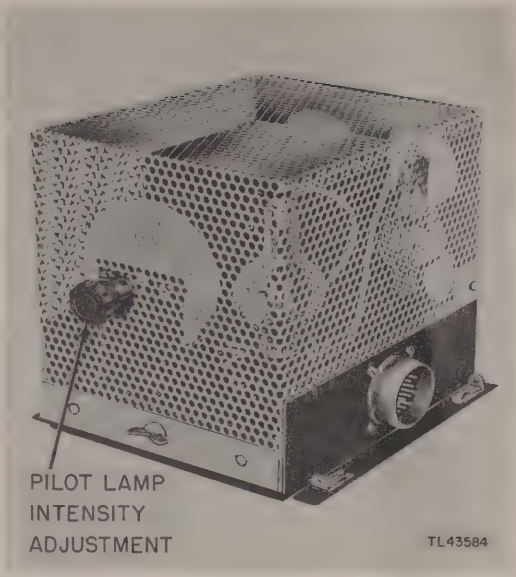

Figure 29. 24-volt supply. Rectifier Power Unit PP–89/TPL–1.

(6) Screwdriver POSITION adjustment for positioning the range pedestal at 10,000 yards range.
(7) Screwdriver LENGTH adjustment for positioning the range pedestal at 50,000 yards range.
(8) AZ. SEARCH knob.
(9) AZIMUTH DIAL LOCK knob.
(10) AZIMUTH handwheel.

28. RECTIFIER POWER UNIT PP–89/TPL–1 (fig. 29).

The low voltage power unit (24-volt supply) is mounted in the back of the lower left-end section of the console cabinet in an open-work metal shield (figs. 16 and 17). Extending from its base is a single cable connector. The operating control on the low voltage power unit is a rheostat that controls the brightness of certain of the cabinet dial lights (fig. 29). This control may be adjusted after removal of the rear panel of the left-end section of the cabinet (fig. 17).

SECTION VI
R-F GROUP

29. GENERAL.

The r-f group consists of those components through which the ultra-high frequency energy passes. These include the r-f transmission line, the antenna assembly, and the T/R box. The r-f energy generated by the transmitter oscillator is conducted through the r-f transmission line to the antenna assembly, and is then radiated into space. A reflected signal is picked up by the antenna assembly and sent to the T/R box along the same r-f transmission line.

30. R-F LINE.

The transmission line is installed in the left-end and center sections of the console cabinet, in the pedestal, and in the antenna assembly. It extends from the transmitter oscillator to a point below the center of the pedestal, and then projects vertically upward. Rotating joints permit motion in azimuth and elevation, and also permit the antenna dipole to spin.

31. ANTENNA ASSEMBLY AS–113/TPL–1 (fig. 21).

The antenna assembly is located on the upper end of the pedestal, and is mounted so that it can rotate in azimuth and tilt in elevation. Essentially, it consists of the antenna, the paraboloid, and the spinner motor-generator. The function of the dipole is to radiate the r-f energy. The paraboloid focuses the energy into a narrow beam, and directs it into space. The spinner motor spins the antenna dipole at a fixed speed. This movement of the dipole should not be confused with the movement of the entire antenna assembly.

32. T/R BOX.

The T/R (transmit-receive) box is mounted on the shelf in the left-end section of the console cabinet (figs. 16 and 69). It has three electrical connections: the transmission line from the antenna, the connection to the crystal mixer, and a high-voltage lead from the modulator power supply. The T/R box can be adjusted by means of two tuning plugs.

SECTION VII
CONTROL GROUP

33. GENERAL.

In Radar Set AN/TPL–1 there are many adjustments to be made with switches, potentiometers, and other types of controls. Some controls, such as the WINTER-SUMMER switch, are adjusted before the set is placed in operation. Other controls, such as the LIGHTS switch, are adjusted before the individual period of operation. Finally, still other controls, such as the GRID and REFLECTOR potentiometers, are adjusted during the actual operation of the radar set. In this description the controls are classified as switches, circuit breakers, meters, variable electrical controls, variable mechanical controls, and miscellaneous controls and devices.

34. SWITCHES.

The following switches are listed according to their relative positions on the set.

a. Console Cabinet, Center Section. The front panels of this section contain the majority of the switches with which the operator will be concerned.

(1) POWER, 60-CYCLE. Located on a small subpanel to the right of the range indicator unit (fig. 64), this switch (fig. 35) controls the 60-cycle power to all circuits and devices except the convenience outlets on the ends of the cabinet and on the circuit breaker panel, the 24-volt power supply, the cabinet heaters, and the cabinet blower. The cabinet heaters and blower are controlled by other switches in the

control circuits. A blue pilot lamp above the switch lights when the 60-cycle POWER switch is thrown ON.

(2) POWER, 400-CYCLE. This switch, located to the right of the 60-cycle POWER switch, (fig. 35) controls the 400-cycle power to all circuits and devices, except the two convenience outlets on the circuit breaker panel. An amber panel lamp, mounted above the switch, lights when the switch is thrown on.

(3) LIGHTS. The switch to the right of the 400-cycle POWER switch (fig. 35), labeled LIGHTS, controls all the dial lamps, except the PPI scale and grid lamps.

(4) MARKER. When in the ON position, this switch (fig. 35) permits range marker signals generated in the synchronizer to appear on the PPI and range scopes.

(5) BUZZER. The BUZZER switch (fig. 35) is used to operate a buzzer that notifies the personnel at the searchlight that the radar set is on target.

(6) CHALLENGE. This switch, mounted to the right of the BUZZER switch (fig. 35), is used in conjunction with the IFF equipment employed with Radar Set AN/TPL–1.

(7) TRANSMITTER POWER, ON-OFF. Located on a small sub-panel to the left of the PPI scope (fig. 64), this switch (fig. 34) controls the application of power to the transmitter system. Voltage, which is present at the switch two minutes after the 60-cycle and 400-cycle POWER switches (fig. 35) have been thrown, is fed to the modulator power supply and the TRANSMITTER POWER HIGH-LOW switch. The cabinet heaters are automatically turned off when the switch is turned on.

(8) TRANSMITTER POWER, HIGH - LOW. Power is present at this switch (fig. 34) when the green pilot lamp lights. When in the LOW position, the switch applies this power to the transmitter system and the radar set operates under low power. One minute after the green pilot lamp lights, a red pilot lamp above the TRANSMITTER POWER HIGH-LOW switch lights. The switch may now be thrown into the HIGH position and radar set will operate under high power.

(9) EL. SEARCH. Mounted in the lower left part of the main drive assembly (fig. 64), this push-pull type switch controls operation of the antenna assembly in elevation. When pulled OUT, the switch closes a circuit energizing the magnetic clutch and providing automatic searching in elevation. Because the elevation search switch is in series with a second switch operated by the AZ. SEARCH control, the radar set may be operated in automatic elevation search only during automatic azimuth search. When the switch is pushed IN, the antenna assembly may be tilted manually in elevation.

(10) AZ. SEARCH. This control is in the lower right part of the main drive assembly (figs. 28 and 64). When the control knob is in the OUT position, the following circuits are affected as indicated:

(*a*) The azimuth search motor is switched on, provided that the AZIMUTH LOCK knob (fig. 50) has been pulled out.

(*b*) The power to the aided range mechanism is removed.

(*c*) The a-c voltage is removed from the selsyn rotors.

(*d*) Power is applied to the EL. SEARCH switch (fig. 64).

(*e*) The mechanical clutch engages the scan motor with the antenna azimuth-drive mechanism, and disengages the azimuth handwheel. The radar set can be operated in automatic azimuth search either with or without automatic elevation search.

(11) AIDED RANGE. This control is mounted above the RANGE handwheel, and governs the action of the aided range mechanism (fig. 64). It provides both electrical and mechanical changes in the aided range mechanism. When the control knob is pushed in, power is applied to a constant speed motor, provided the AZ. SEARCH switch is in the MANUAL position. The control also engages a mechanical clutch connected to the aided range gearing. When the control knob is pushed in and turned, the constant speed motor introduces a rate of motion and a displacement into the range gearing, causing the range pedestal to move automatically across the screen of the range scope.

(12) YARDS. The YARDS switch, mounted on a small panel beneath the range scope (fig. 65), is the range selector switch which controls the maximum range in yards presented on the PPI and range scopes. The two settings are 30,000 and 60,000.

b. Console Cabinet, Right-end Section. The receiver and the synchronizer chassis are behind the front panel of the right-end section of the console cabinet (figs. 14 and 15). Three switch controls are located on these components.

(1) A-J SWITCH (fig. 24). This toggle switch, mounted on the lower part of the front panel of the receiver, is normally in the OFF position. When thrown to ON, it changes the receiver circuits in order to reduce jamming interference. The switch can be reached through a door in the front panel of the right-end section.

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(2) RANGE PEDESTAL WIDTH (fig. 68). This switch, mounted on the front panel of the synchronizer, controls the width of the range pedestal in microseconds. The switch can be reached through the door in the right-end section panel.

(3) A-J BLANKING (fig. 25). This three-position gang switch, mounted on the front panel of the synchronizer, is normally in the OFF position. When thrown to HOR or VER it changes the receiver circuits in order to reduce jamming interference. The switch can be reached through a door in the front panel of the right-end section.

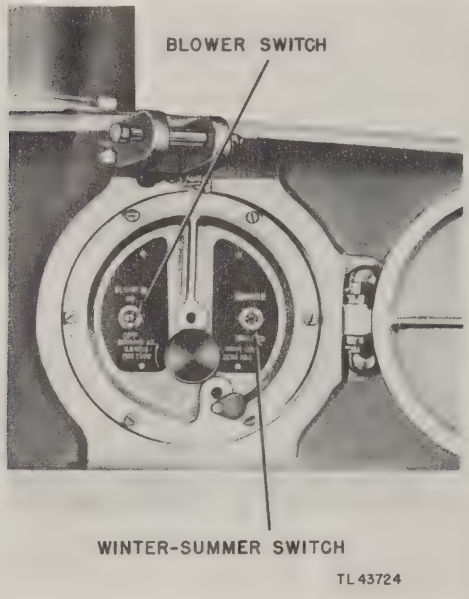

Figure 30. Blower switch and winter-summer switch.

c. Pedestal Base. Mounted around the base of the pedestal are several cover plates and two circular doors, which conceal the following switch-type controls (fig. 18).

(1) WINTER-SUMMER (fig. 30). This switch is located behind a circular door on the right side of the pedestal base. In the WINTER position, the switch provides additional torque in the motor to overcome starting difficulties in cold weather.

(2) BLOWER (fig. 30). This toggle switch is concealed by a circular door on the right side of the pedestal base. It controls the cabinet blower motor mounted in the base of the pedestal and should be turned on before either 60-cycle or 400-cycle power is applied to the set.

(3) SPINNER MOTOR (fig. 18). On the front of the pedestal base is a finger-pressure type switch. Normally in the OFF position, the operator holds the switch in the ON position whenever the radar set is to be re-started immediately after it has been turned off. This action enables the spinner motor to start again without the normal 30-second time delay (to permit relay recycling) between stopping and starting.

d. Ventilation Assembly. Located on the under side of the ventilation assembly on the right-end section of the cabinet (fig. 52), two toggle switches control the blower motors in the assembly, and therefore the ventilation in the tent.

e. Cabinet Door Interlocks (fig. 31). Four interlocks in series are provided in the 400-cycle power circuit, and any interlock will open the circuit whenever the cabinet panel covering it is removed. The locations of these switches are as follows:

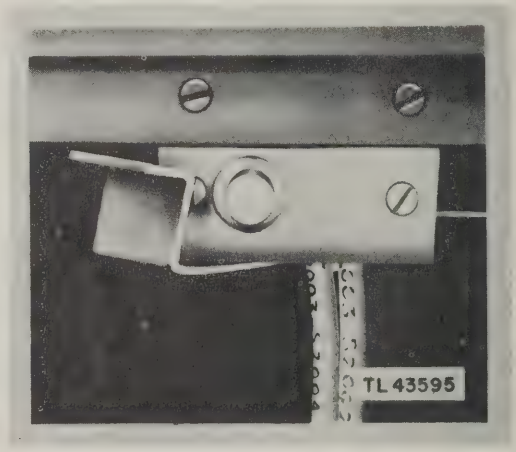

Figure 31. Interlock switch.

(1) Right-end section, front.
(2) Left-end section, front.
(3) Left-end section, rear.
(4) Center section, rear.

35. CIRCUIT BREAKERS (fig. 32).

A total of 25 circuit breakers protect the radar set against overload conditions. Twenty-four of these manual-reset type circuit breakers are mounted on the circuit breaker panel in the rear right-end section of the cabinet (figs. 16 and 17). The circuit breakers can be reached by removing the cover plate, and are identified by nameplates. The overload relay located on the shelf in the rear left-end section of the cabinet is also considered as a circuit breaker. This relay is in the power-supply circuit of the modulator, and once opened, the contacts can be reset by the RESET switch on the panel beneath the H.V. CURRENT

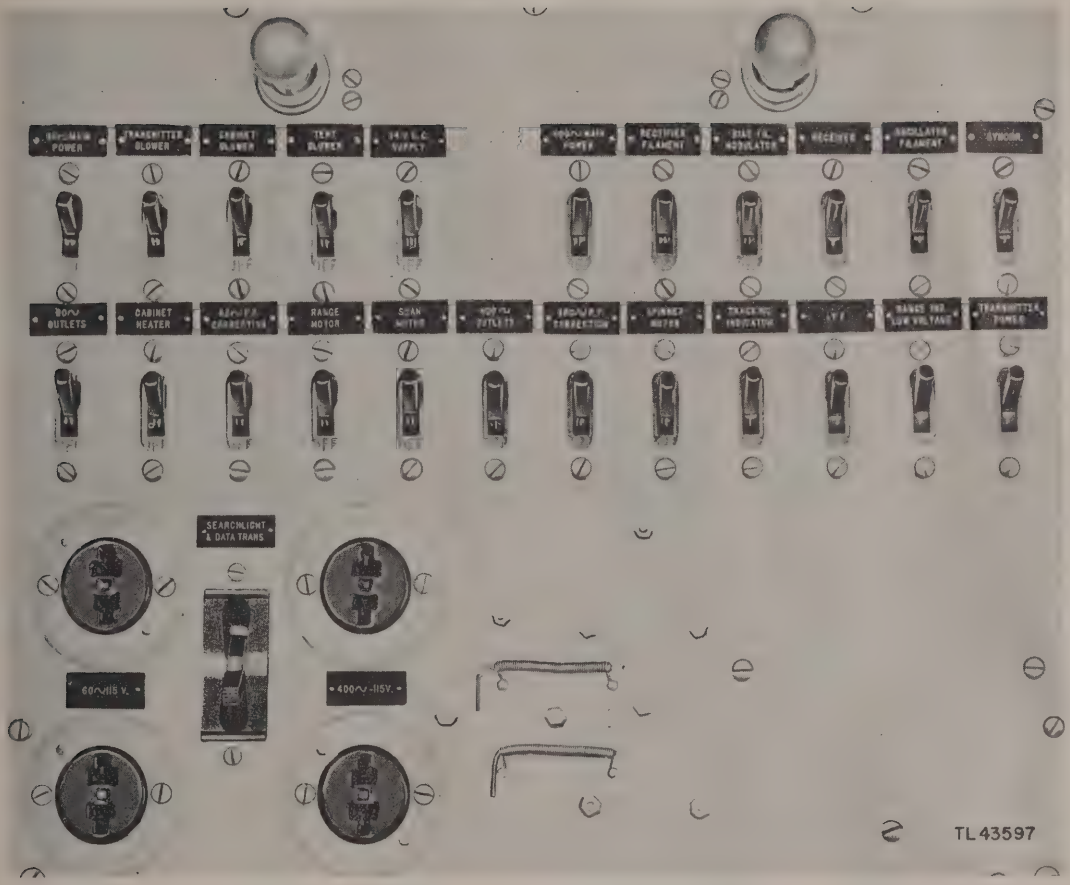

Figure 32. Circuit breaker panel.

meter (fig. 34). The RESET switch is spring-loaded and is normally in the OFF position.

36. METERS (fig. 33).

Three meters, all located on the front of the cabinet, are provided in Radar Set AN/TPL–1.

a. Line-Voltage Meter. This meter indicates the voltage received from the external power source, and can be read through a window in the front panel of the left-end section. Normally, the meter indicates the 400-cycle voltage, but the 60-cycle voltage can be read by depressing the button beneath the

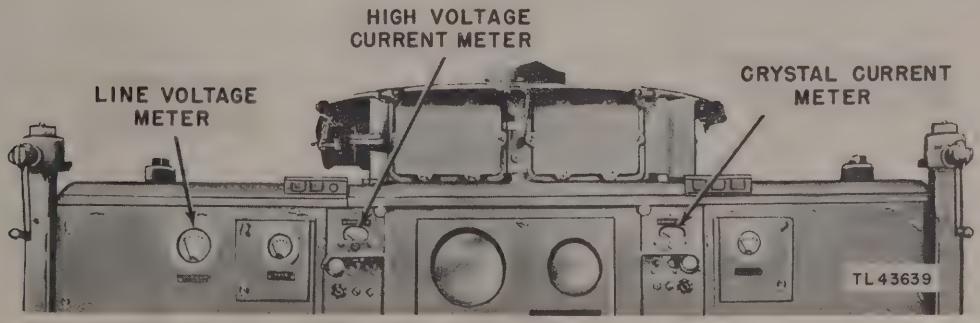

Figure 33. Location of meters.

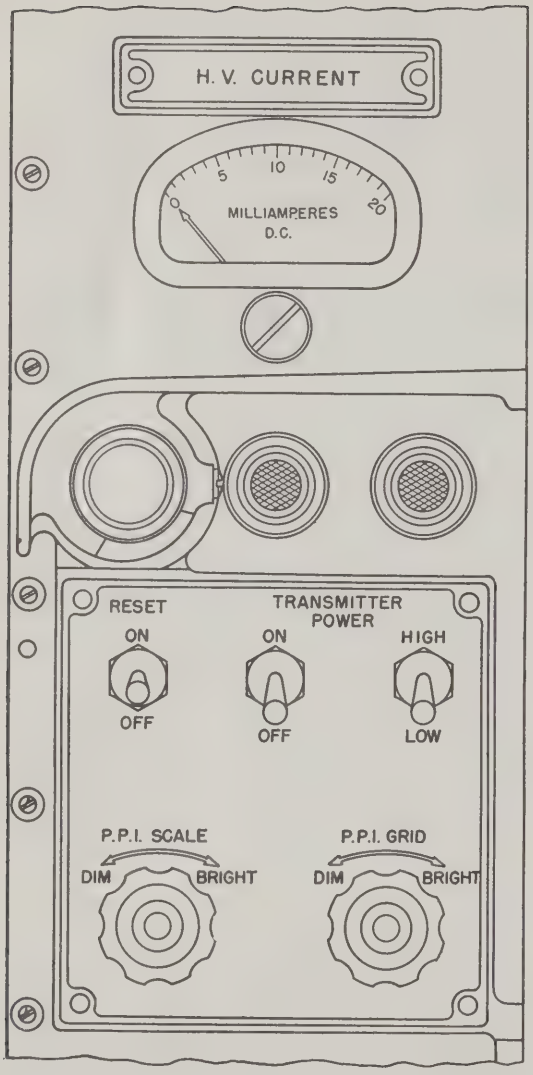

Figure 34. Left control panel.

meter. This button is labeled PUSH TO READ 60-CYCLE (fig. 58).

b. Transmitter Current Meter. The H.V. CURRENT milliammeter which indicates the average current drawn by the transmitter from the high-voltage supply is located to the left of the PPI scope (figs. 33 and 34).

c. Crystal Current Meter. The CRYSTAL CURRENT milliammeter, to the right of the range scope (figs. 33 and 35), indicates the rectified local oscillator current passing through the crystal mixer.

37. VARIABLE ELECTRICAL CONTROLS.

This group includes the potentiometers and rheostats which must be set by the operator. Some of these controls are provided with knobs, while others require a screwdriver for adjustment.

a. Control Knobs. The control knobs described below are accessible to the operator, and, in all cases, nameplates indicate the purpose of the individual control. The controls are listed according to their location in the console cabinet.

(1) CENTER SECTION. The front panel on the center section of the cabinet contains most of the control knobs which require adjustment by the operator.

(*a*) *PPI Scale (fig. 34).* The P.P.I. SCALE control, on the small panel to the left of the PPI scope, varies the brightness of the light striking the circular scale around the edge of the PPI scope screen.

(*b*) *PPI Grid (fig. 34).* To the left of the range scope, is the P.P.I. GRID potentiometer which controls the amount of light striking one of the two plastic overlays that cover the PPI scope screen. These overlays are marked with grid coordinates which represent the two fixed ranges of the radar set. The setting of the YARDS switch governs which grid is illuminated at any given time.

(*c*) *Receiver Gain (fig. 35).* Mounted on the small panel to the right of the range scope, the RECEIVER GAIN control changes the amplification of the reflected radar signal.

(*d*) *IFF Gain (fig. 35).* The I.F.F. GAIN control, located to the right of the RECEIVER GAIN control, varies the amplification of the IFF signal.

(*e*) *PPI Focus (fig. 65).* The sharpness of the image presented on the PPI scope screen can be varied by means of the P.P.I. INDICATOR FOCUS control which is mounted on a small panel beneath the range scope.

(*f*) *PPI Intensity (fig. 65).* The brightness of the signal appearing on the PPI scope screen is controlled by the P.P.I. INDICATOR INTENSITY potentiometer which is mounted beneath the PPI FOCUS control.

(*g*) *Range Indicator, Focus (fig. 65).* The RANGE INDICATOR FOCUS control changes the sharpness of the image appearing on the range scope.

(*h*) *Range Indicator, Intensity (fig. 65).* Located beneath the FOCUS control for the range scope, the RANGE INDICATOR INTENSITY potentiometer changes the brightness of the image presented on the range scope.

(2) LEFT-END SECTION. A rheostat, which is mounted on the low-voltage power supply (fig. 29) in the rear of the left-end section (fig. 17), controls the brightness of all cabinet lights, except the grid and azimuth scale lamps for the PPI scope, the circuit breaker panel lights, and the two hooded front panel lights.

(3) RIGHT-END SECTION. The controls on the receiver and synchronizer can be reached through a door in the front panel of the right-end section of the cabinet (fig. 68).

(*a*) *Reflector Knob.* The REFLECTOR control knob on the front panel of the receiver (fig. 68) varies the negative voltage on the reflector of the klystron local oscillator.

(*b*) *Grid Knob.* The GRID potentiometer, located beneath the REFLECTOR voltage control (fig. 68), regulates the voltage on the grid of the klystron local oscillator.

(*c*) *Local Oscillator Knob (fig. 68).* The LOCAL OSCILLATOR tuning control is also on the front panel of the receiver. Oscillator tuning is accomplished by turning the control and observing the range scope. The control is turned until the reflected ground target is of maximum amplitude on the range scope.

(*d*) *Range Gate Level Adjustment (fig. 68).* The amount of "noise" which will appear on the tracking indicators when no target is ranged is determined by the setting of this control on the front panel of the synchronizer.

b. Screwdriver Adjustments. This type of electrical control usually requires less frequent setting than the control knobs just considered. A small screwdriver is fastened on the back of the hinged cover plate below the PPI scope (fig. 65). The adjustments will be considered according to their chassis location.

(1) CONSOLE CABINET, CENTER SECTION. Most of the screwdriver-operation adjustments are located on the front panel of the center section, and include:

(*a*) *PPI Scope Adjustments (fig. 65).* Back of a hinged cover plate beneath the PPI scope, are five potentiometers which affect the circuits of this scope. From left to right, these controls are: the 30,000 CENTER and 30,000 LENGTH, 60,000 CENTER and 60,000 LENGTH adjustments, and the INTENSITY EQUALIZER.

(*b*) *Range Scope Adjustments (fig. 65).* To the right of the PPI scope adjustments, are four range scope potentiometer controls. From left to right, these controls are: the 30,000 LENGTH, HOR. ADJUST, 60,000 LENGTH, and VERT. ADJUST. These controls are used to control the length and position of the sweep.

(*c*) *Range Pedestal Length Adjustment.* To the

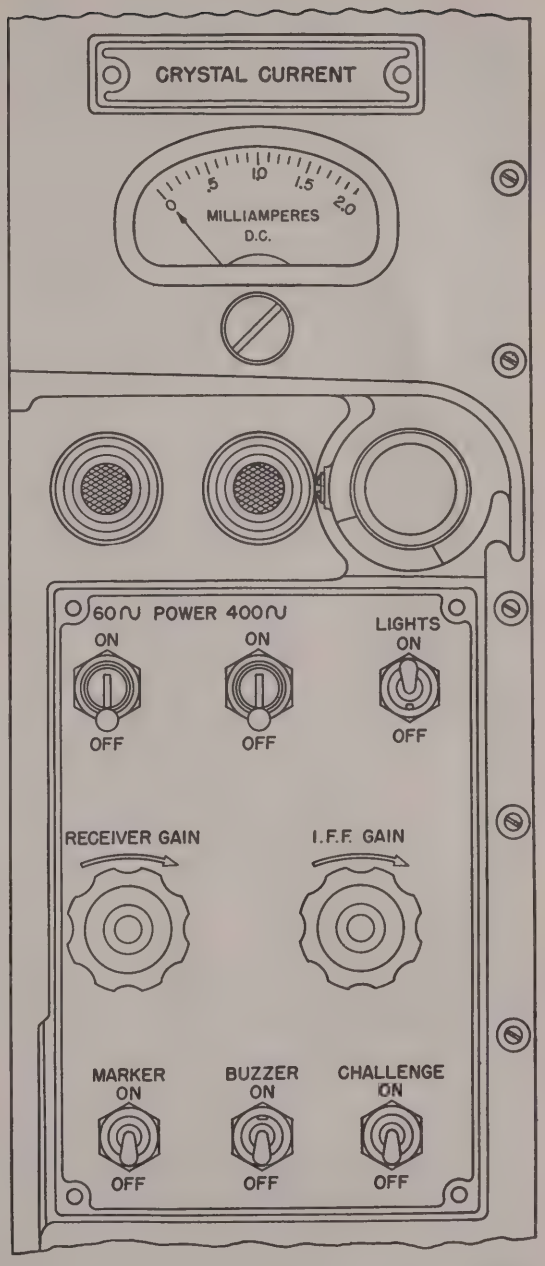

Figure 35. Right control panel.

left of the AZIMUTH handwheel is a screwdriver adjustment that is concealed by a screw cap (fig. 64). This control, labeled LENGTH, is used to adjust the range pedestal at the 60,000-yard end of the sweep trace.

(*d*) *Range Pedestal Position Adjustment.* Beneath the LENGTH adjustment, is a second control covered by a screw cap (fig. 64). Marked POSITION, this control is used to adjust the range pedestal at the zero range end of the sweep trace.

(2) CONSOLE CABINET, LEFT- AND RIGHT-END SECTIONS. Behind doors in the front panels of the left- and right-end sections (fig. 14), are the screwdriver adjustments on the tracking indicators (fig. 67). These controls regulate the position, intensity, and focus of the sweep traces. From left to right on the tracking indicators, these potentiometers are labeled: VERT CENT, FOCUS, INT, and HOR CENT.

(3) PEDESTAL BASE. Behind the two circular doors on the base of the pedestal are two controls marked ZERO ADJ. The adjustment behind the right door (fig. 18) mechanically controls the zero position of the stator of the 33:1 azimuth selsyn with respect to the 1:1 azimuth selsyn. The zero position of the stator of the 33:1 elevation selsyn with respect to the 1:1 elevation selsyn is controlled by the zero adjustment behind the door (fig. 19) on the left side of the pedestal base.

NOTE: Other selsyn adjustments are described in paragraph 38b.

38. VARIABLE MECHANICAL CONTROLS.

Included in this classification are those controls which, when adjusted, cause some mechanical movement, as contrasted to the electrical effect of a potentiometer. The group includes handwheels as well as small control knobs, and it is divided according to location in the radar set.

a. Console Cabinet, Center Section. Several mechanical controls in the antenna positioning system are located on the main drive assembly. These include:

(1) ELEVATION HANDWHEEL (fig. 64). This handwheel is mechanically linked, at all times, to the antenna assembly, and controls the position of the assembly in elevation.

(2) AZIMUTH HANDWHEEL (fig. 64). This control, which positions the antenna assembly in azimuth, is linked to the assembly only when the operator is tracking a target, or the set is in manual search. In automatic search, the scan motor moves the antenna, but it does not turn the azimuth handwheel.

(3) RANGE HANDWHEEL. This handwheel (fig. 64) positions the range pedestal on the range scope.

(4) ALTITUDE DIAL LOCK. The rectangular control knob above the RANGE handwheel (fig. 64) disconnects (by means of a friction clutch) the altitude dial from the mechanism which normally drives it. Thus, the reading of the altitude dial can be adjusted to indicate either target height above sea level or target height above the radar set. The dial is disengaged when the control knob is pulled out.

(5) AZIMUTH DIAL LOCK. The circular control knob, above the AZIMUTH handwheel (fig. 64), disconnects (by means of a friction clutch) the azimuth dial and the rotating yoke on the PPI scope from the antenna assembly. By means of this control, the antenna assembly can be turned to point north (or to any selected reference direction) without moving the azimuth dial or the rotating yoke. The dial and yoke are disengaged from the antenna when the control knob is pulled out.

(6) ELEVATION LIMIT CAM CONTROLS. A door in the rear panel of the center section of the cabinet gives access to the adjustments that determine the setting of the elevation limit cams (fig. 17). To change the setting, an index pin (fig. 70) is pulled out, the cams turned to the desired setting; as indicated by two pointers, and the index pin released.

(7) PPI SWEEP-CENTERING CONTROLS. Two mechanical screwdriver adjustments are mounted on the range indicator unit. These controls, located on either side of the PPI scope screen (fig. 66), can be reached by loosening the slotted thumbscrews and lowering the large front door on the unit. The adjustments physically move the focus coil of the scope, and therefore tilt the electron stream, in order to move the sweep trace on the scope screen.

b. Pedestal. Around the base and on the top of the pedestal are several mechanical adjustments.

(1) INCREASE AZ. Behind the circular door (fig. 18) on the right side of the pedestal base is a knob (fig. 78) that changes the relative positions of the antenna and the azimuth selsyns. It is used to aid in obtaining synchronization between radar set and searchlight.

(2) INCREASE EL. Behind the circular door (fig. 19) on the left side of the pedestal base is a knob (fig. 77) that changes the relative position of the antenna and the elevation selsyns. It is used to aid in obtaining synchronization between radar set and searchlight.

(3) AZIMUTH LOCK. On the front of the pedestal base is a knob (fig. 18) which, when pushed in, engages a shaft in a slot in the azimuth drive

gear. It also operates a microswitch that interrupts the scan motor circuit. Thus, the shaft locks the antenna assembly in azimuth.

(4) ELEVATION LOCK. When tightened, the ELEVATION LOCK knob (fig. 20) prevents the antenna assembly from moving in elevation.

39. MISCELLANEOUS CONTROL DEVICES.

Three levels of the bubble type are provided with the radar set. Two levels (fig. 19), at right angles to each other, are mounted on the front left corner of the pedestal base. These are used for the initial rough leveling of the set. The third level (fig. 20) is mounted on the top of the pedestal and is used for the final leveling of the set. For leveling the radar set prior to operation, four jacks are supplied, one at each corner of the console cabinet. These jacks are also used in removing and replacing the wheel assemblies.

SECTION VIII
NOMENCLATURE, PHYSICAL DATA, AND POWER REQUIREMENTS

40. LIST OF MAJOR COMPONENTS.

A list of the major components of Radar Set AN/TPL–1 appears in table I.

TABLE I

LIST OF MAJOR COMPONENTS

Name	*Signal Corps Designation*	*Name*	*Signal Corps Designation*
Antenna assembly	Antenna Assembly AS–113/TPL–1	Cabinet (Includes crystal mixer, magnetron, and T/R box)	Console Cabinet CY–153/TPL–1
Pedestal	Pedestal AB–39/TPL–1		
Receiver	Radar Receiver R–85/TPL–1	High-voltage power supply	Rectifier Power Unit PP–88/TPL–1 (high-voltage power unit)
Synchronizer	Synchronizer SN–14/TPL–1		
Modulator	Modulator MD–31/TPL–1	Range indicator unit (Contains PPI scope and range scope)	Range Indicator Unit ID–81/TPL–1
Pulse transformer	Pulse Transformer MX–187/TPL–1		
Tracking indicator	Tracking Indicator ID–82/TPL–1	Preamplifier	Pre-Amplifier AM–42/TPL–1
		Ventilation assembly	Ventilation Assembly MX–231/TPL–1
Main drive	Main Drive Assembly MX–186/TPL–1	Special test set	Test Set TS–216/TPL–1
		Tent	Tent S–14/TPL–1
24-volt power supply	Rectifier Power Unit PP–89/TPL–1 (low-voltage power unit)	Power cable	Cord CX–273/TPL–1
		Data cable	Cord CX–274/TPL–1

41. POWER REQUIREMENTS.

The power requirements for Radar Set AN/TPL–1 are given in table II. Power Unit PU–35/U is used with Radar Set AN/TPL–1.

TABLE II

ELECTRICAL POWER REQUIREMENTS

Frequency	400 cycle and 60 cycle	Load, 400-cycle	2 kva
Load, 60-cycle	2 kva	Voltage, 400-cycle	115v rms
		Voltage, 60-cycle	115v rms

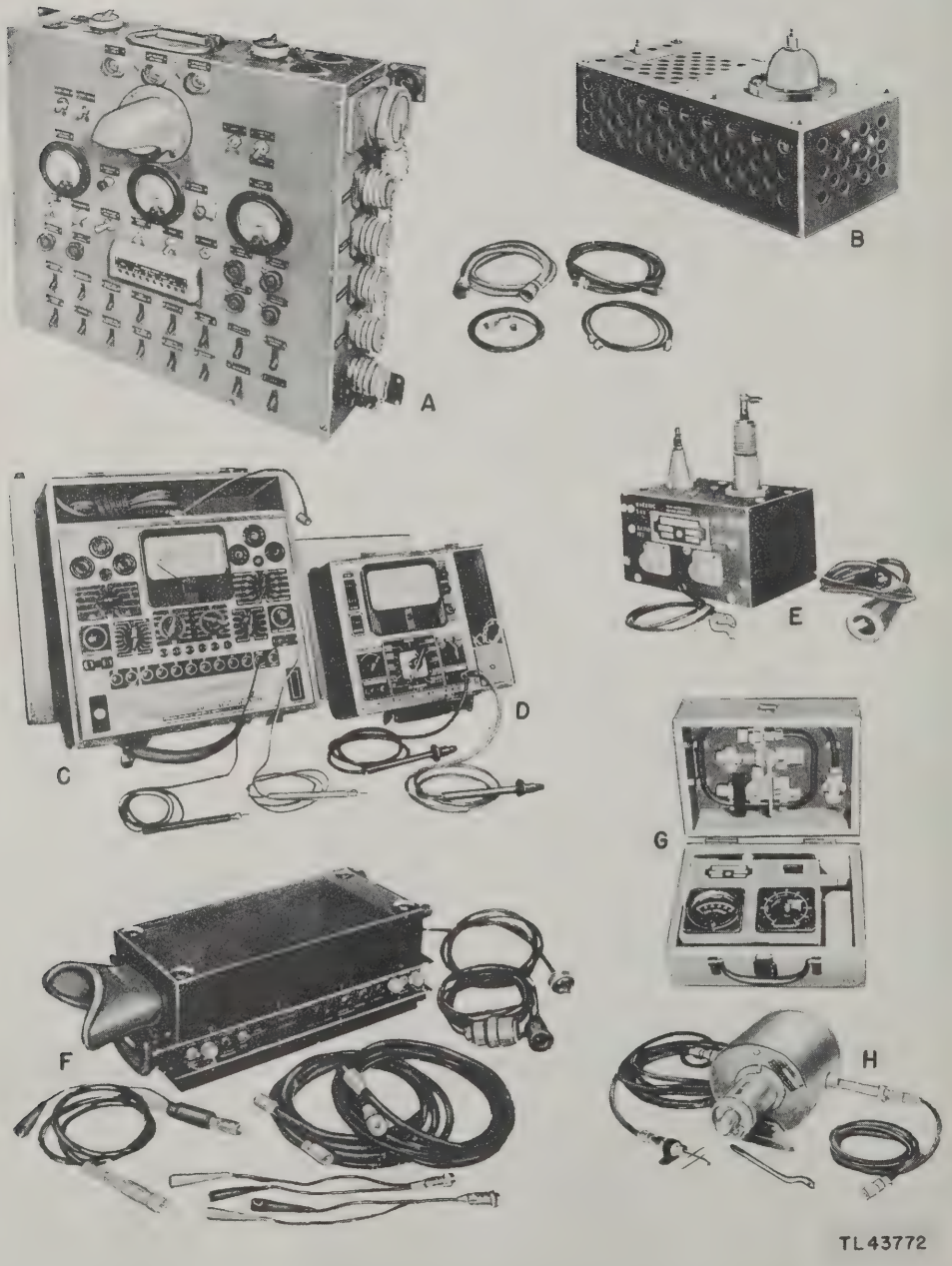

Figure 36. Test equipment.

42. PHYSICAL DATA.

The physical data associated with the principal units of Radar Set AN/TPL–1 are listed in table III.

TABLE III

PHYSICAL DATA

DIMENSIONS.	
Length overall, in inches.	
Wheels in place	104¾
Wheels removed	98½
Width overall, in inches.	
Wheels in place	64½
Wheels removed	46¼
Height overall, in inches.	
Wheels in place	92½
Wheels removed, jacks extended	108
NOTE: These dimensions are taken with the paraboloid at zero mils elevation. The height is two inches less when the paraboloid is at 1,600 mils.	
Wheels removed, jacks retracted	87½
WEIGHT, in pounds.	
Radar set complete	2,550
Tent	125
Data cable and reel	152
Power cable and reel	72
OPERATING SPACE REQUIRED FOR THE SET.	
A circular area with a diameter of at least	28 ft
MAXIMUM INCLINE OF SITE.	
Front and rear jacks at different levels	25 degrees
Right and left jacks at different levels	10 degrees
TIRE PRESSURE	30 lbs/sq in.
TIRE SIZE	6.00 x 16

SECTION IX
TEST EQUIPMENT AND TOOLS

43. TEST EQUIPMENT.

One set of test equipment (figs. 36 and 37) is furnished with each group of three radar sets. The equipment includes the following items:

a. Test Set TS–216/TPL–1, and cables, (A).
b. Dummy Load TS–279/UPM (for modulator), (B).
c. Test Set I–157 (vacuum tube checker), (C).
d. Analyzer I–153, (D).
e. Voltage Divider TS–265/UP, (E).
f. Oscilloscope TS–34/AP, (F).
g. Wavemeter Test Set TS–117/GP, (G).
h. Echo Box TS–207/UP, (H).
i. Signal Generator, WIT, Model 43–41 (fig. 37).

44. TOOL EQUIPMENT.

One Tool Equipment TE–113 kit is supplied with each group of five radar sets.

a. List of Components. A metal toolbox is furnished as part of Tool Equipment TE–113. This box is equipped with a carrying handle and a metal tray for the small tools. The tools are illustrated in figure 38, in which the numbers correspond to the number in the first column of table IV.

b. Special Tools. A number of operations in the maintenance of Radar Set AN/TPL–1 involve work of a special and sometimes delicate nature and specially constructed tools are therefore required. These tools are described in TM 11–1452.

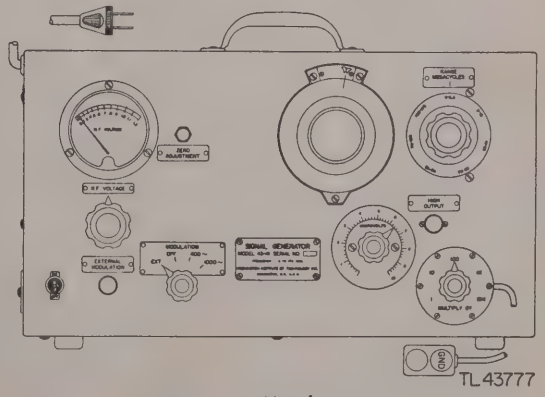

Figure 37. Signal generator.

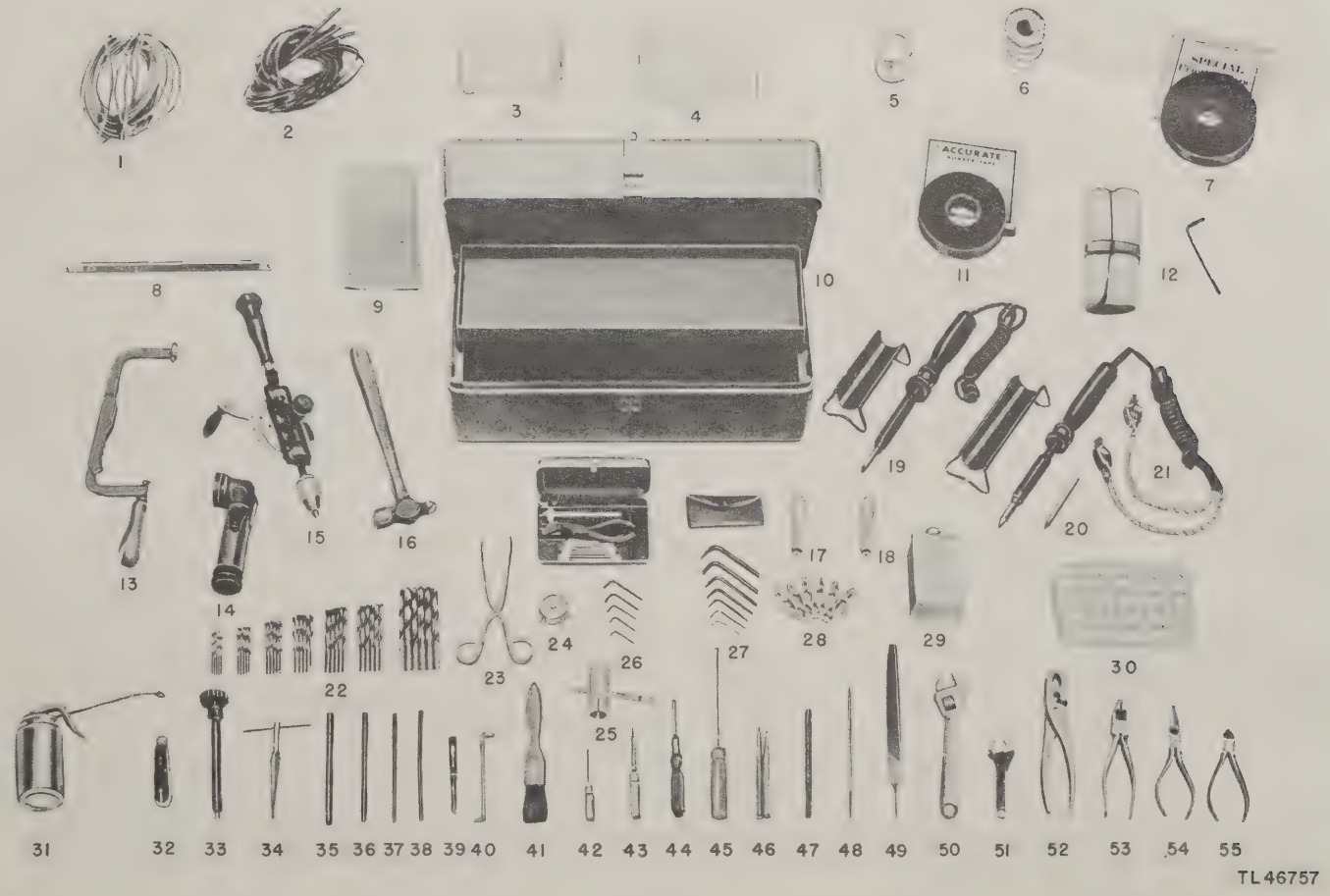

Figure 38. Tool equipment.

TABLE IV

TOOL EQUIPMENT TE–113

No.	*Quantity*	*Tool*	*Description*	*Stock No.*
35	1	ALIGNMENT TOOL	Neutralizing	6Q336
33	1	ALIGNMENT TOOL	TL–207	6Q349
41	1	BRUSH	Flat; 1″	6Z1401
29	1	DRY-CLEANING SOLVENT	8 oz; metal screw-top can	6G184.1
10	1	CHEST	CH–77	6Q19095
47	1	CHISEL	Cold; ⅜″ x 5.25/5.75″	6Q19806
30	1	CONTAINER	17 compartment; 1¼″ x 4¼″ x 7⅜″	6Z3201
15	1	DRILL	Hand	6Q32001
22	1	DRILL SET	Twist; straight shank	6Q36704
49	1	FILE	Flat; 8″	6Q38033–8
48	1	FILE	TL–133; round; 6″	6Q38500–6
14	1	FLASHLIGHT	TL–122	6Z4002
13	1	FRAME	Hacksaw; adjustable; 8-12″	6Q41000
16	1	HAMMER	Ball pein; 12 oz	6Q49712
32	1	KNIFE	TL–29	6Q60229
31	1	OILER	6 oz; force feed control	6Z7306
53	1	PLIERS	TL–13; side-cutting; 6″	6R4513
55	1	PLIERS	TL–103; diagonal cutting; 5″	6R4603
52	1	PLIERS	TL–125; gas; 8″	6R4625
54	1	PLIERS	TL–126; long nose; 6″	6R4626
46	2	PUNCH	Center; ⅜″ x 5″	6R7506–1
34	1	REAMER	Taper; ⅛-½″	6R8652
24	1	RULE	Steel; 72″	6R9629
42	1	SCREWDRIVER	2⅛″ blade	6R15291
44	1	SCREWDRIVER	2½″ blade; 9/16″ tip	6R15312
38	1	SCREWDRIVER	Alignment; 6″ blade	6R19016
40	1	SCREWDRIVER	Offset; double-end	6R18334–1
45	1	SCREWDRIVER	¼″ sq blade; 8″ long	6R14992
43	1	SCREWDRIVER	4″ blade; ⅛″ tip	6R15691
21	1	SOLDERING IRON	12-volt	6R24618
19	1	SOLDERING IRON	TL–117; 110-volt	6R24617
20	1	TIP	For soldering iron	6R24617/1
39	1	TOOL	Contact burnisher	6R41065C
23	1	TUBE PULLER	TL–201	6R7442
36	1	WRENCH	Neutralizing; 5″ long	6R56530
37	1	WRENCH	Neutralizing; 5″ long	6R56531
51	1	WRENCH	Adjustable; 4″ long; ½″ capacity	6R55004
50	1	WRENCH	Adjustable; 8″ long; 15/16″ capacity	6R55008
25	1	WRENCH	Cable connector	6R55315
12	1	WRENCH SET	Multiple spline; in canvas roll	6R57398–1
27	1	WRENCH SET	Allen; in leather envelope	6R57651
26	1	WRENCH SET	Midget	6R55502
8	4	BLADE	Hacksaw 12″	6Q8112–32
3	2 yd	CHEESECLOTH	Bleached	8A805
28	6	CLIP	Test; 1½″ long; ⅜″ jaw spread	2Z2712.6
9	1 sheet	CLOTH	Emery; #000	6Z2000–000
17	1	HANDLE	TL–14; file; 4″ long	6Q51014
18	1	HANDLE	TL–215; file; 4½″ long	6Q51135
4	1 sheet	PAPER	Sand; #000	6Z7500–000
5	1	PASTE	Soldering; 2 oz can	6N4102
6	1 lb	SOLDER	M–31; resin core	6N7531
7	1 roll	TAPE	TL–83; friction	6N8583
11	1 roll	TAPE	TL–94; rubber	6N8594
	6	TERMINAL	TM–10; spade clip; ¼″	3Z9910
	6	TERMINAL	TM–29; spade clip; ¾″	3Z9929
	6	TERMINAL	TM–101; plain eyelet	3Z10101
	6	TERMINAL	TM–113; eye clip	3Z10113
	6	TERMINAL	TM–140; ring	3Z10140
2	9 ft	TUBING	Insulating	3G2514
1	25 ft	WIRE	Hookup; #20 AWG; stranded	1B1320.2

CHAPTER 2
INSTALLATION

SECTION I
SITING

45. TACTICAL CONSIDERATIONS.

Radar Set AN/TPL–1 is designed for use with a 60-inch antiaircraft searchlight. Consequently, the area in which the set is installed will be determined by the requirements of the searchlight equipment.

46. TECHNICAL CONSIDERATIONS.

The exact location of the radar set within the desired area of operation will depend upon considerations discussed below.

a. The ultra-high frequency waves transmitted and received by the radar set travel in straight lines, and in order for the radar set to function properly, the path from the antenna to the target must be free

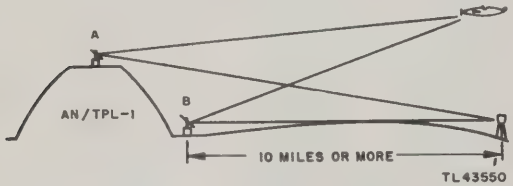

Figure 39. Location of Radar Set AN/TPL–1 using curvature of earth for protection.

from obstructions. Obstructions close to the antenna will give no usable indications on the oscilloscopes, and large masses or large surfaces of metal may

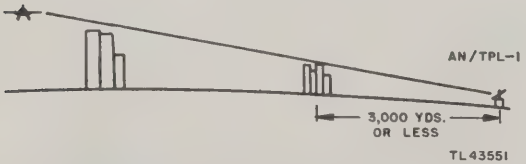

Figure 40. Location of Radar Set AN/TPL–1 using local building for protection.

distort the beam pattern so as to cause inaccuracies when tracking targets at greater ranges. However,

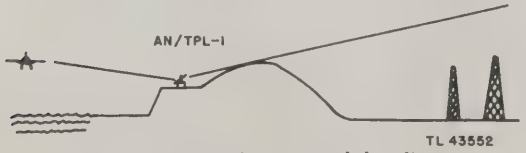

Figure 41. Location on step of shore line.

as shown in figures 39 to 43, artificial or natural obstructions may be used to prevent reception of undesirable fixed echoes.

b. Water tanks, power transmission lines, and radio transmitting antennas, although they may cause no major beam distortion if located far from the radar set, may hide aircraft target echoes. Permanent echoes from such objects make excellent orienting points, provided they are visible and no other reflecting objects are near them. Even if not visible, they may serve for indications of electrical performance.

47. PRACTICAL CONSIDERATIONS.

The area chosen for siting must be large enough to contain the searchlight and radar equipment. In order to minimize parallax errors, the radar set should be located within 50 feet of the searchlight. The radar power unit must be less than 100 feet from the radar set and the IFF antenna should be about 35 feet from the radar set. The ground must be capable

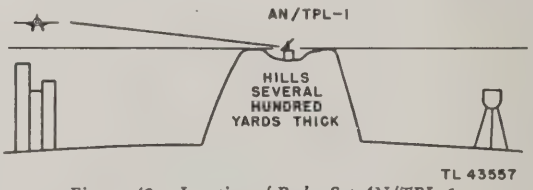

Figure 42. Location of Radar Set AN/TPL–1, elevated position.

of sustaining the weight of the equipment, and must be level enough so that the difference in height between jackfeet does not exceed 15 inches. A block diagram of the searchlight and radar equipment is shown in figure 44.

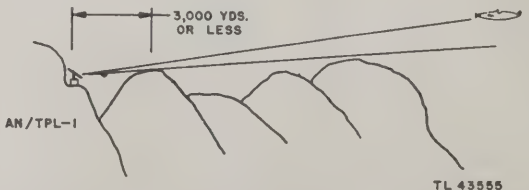

Figure 43. Location of Radar Set AN/TPL–1 in mountains.

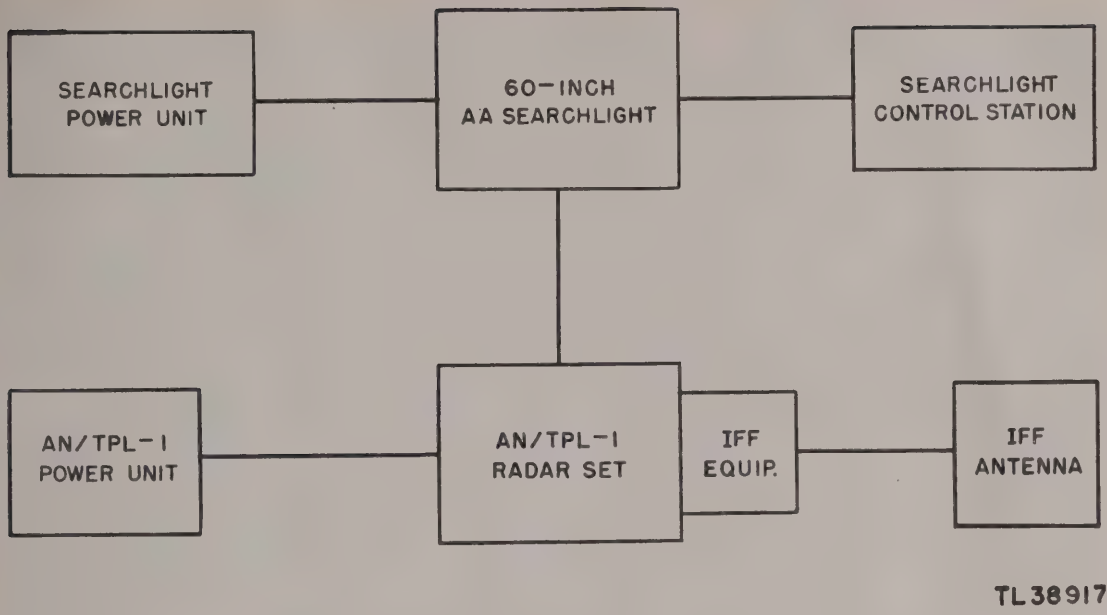

Figure 44. Radar Set AN/TPL–1, with searchlight, block diagram.

SECTION II
SETTING-UP PROCEDURE

48. INSTALLATION.

Radar Set AN/TPL–1 arrives at the operating location completely assembled on wheels in the transporting trailer. The power unit, cables, IFF, and auxiliary equipment are carried in the trailer tow truck.

NOTE: When the set is received as originally shipped from the factory it is disassembled and the components are contained in separate crates. Refer to appendix II for assembly instructions.

a. Unloading. The following steps describe the procedure for unloading the radar set from the trailer.

(1) Tow the trailer to the location selected for the radar set.

(2) Unload the radar set from the trailer, by first removing the steering bar from the storage position on the back of the set, and attaching it to the steering lever (fig. 46). Then detach the hold-down fixtures (fig. 46), tip the trailer body up, lower the tail gate, and allow the radar set to roll out of the trailer under

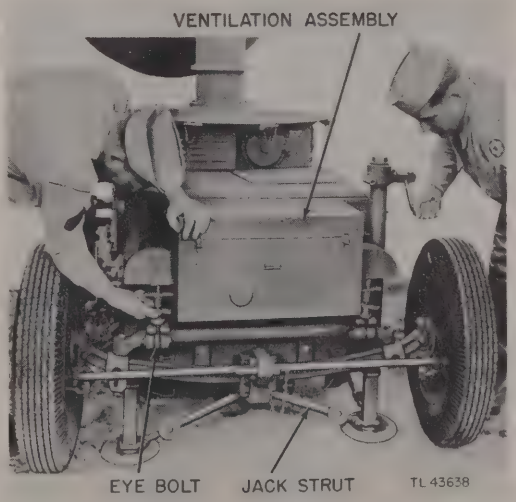

Figure 45. Radar Set AN/TPL–1, front end, removing right wheel assembly.

control of the winch. Guide the set out of the trailer with the steering bar.

CAUTION: Care should be taken to see that the trailer canvas cover and supporting bows do not catch in the antenna assembly.

(3) Tow the empty trailer to the location selected

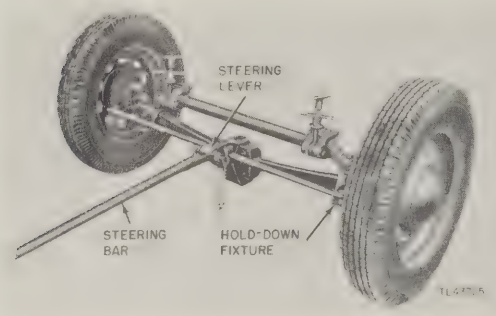

Figure 46. Right wheel assembly removed.

for storing it, and uncouple it from the truck.

(4) Drive the truck to the location of the radar set.

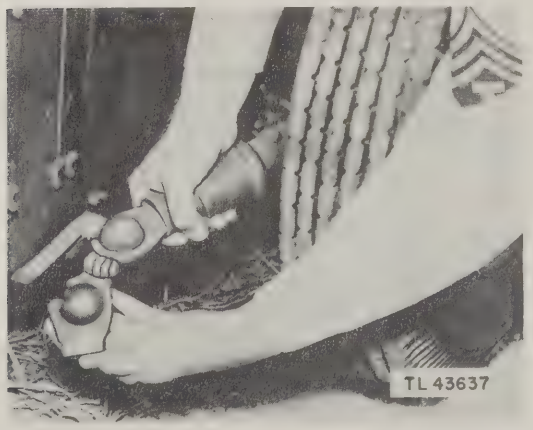

Figure 47. Removing left wheel assembly.

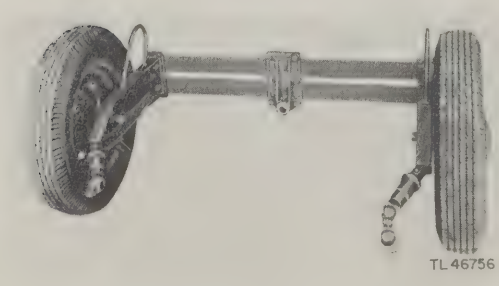

Figure 48. Left wheel assembly removed.

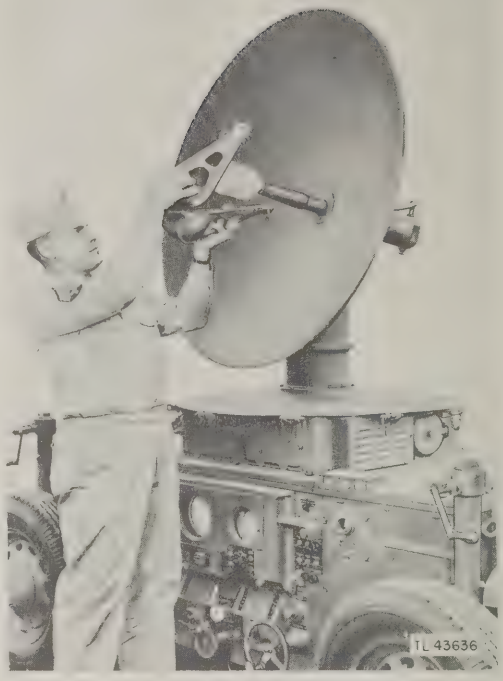

Figure 49. Removing antenna guard.

(5) Unload the cables, IFF, and auxiliary equipment from the truck.

(6) Drive the truck containing the power unit to the site selected for operation.

(7) Unload the power unit from the truck.

b. Setting-up Procedure. Once the radar set has been removed from the trailer, these steps should be followed to position it properly prior to operation.

(1) Loosen the knobs on the jack struts (fig. 45).

(2) With four men working simultaneously, jack the radar set up until the wheels clear the ground by at least one inch. If the ground is not solid, place a

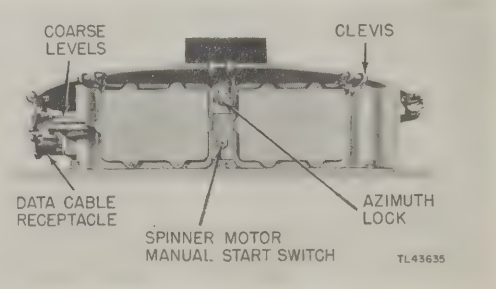

Figure 50. Pedestal AB–39/TPL–1, base.

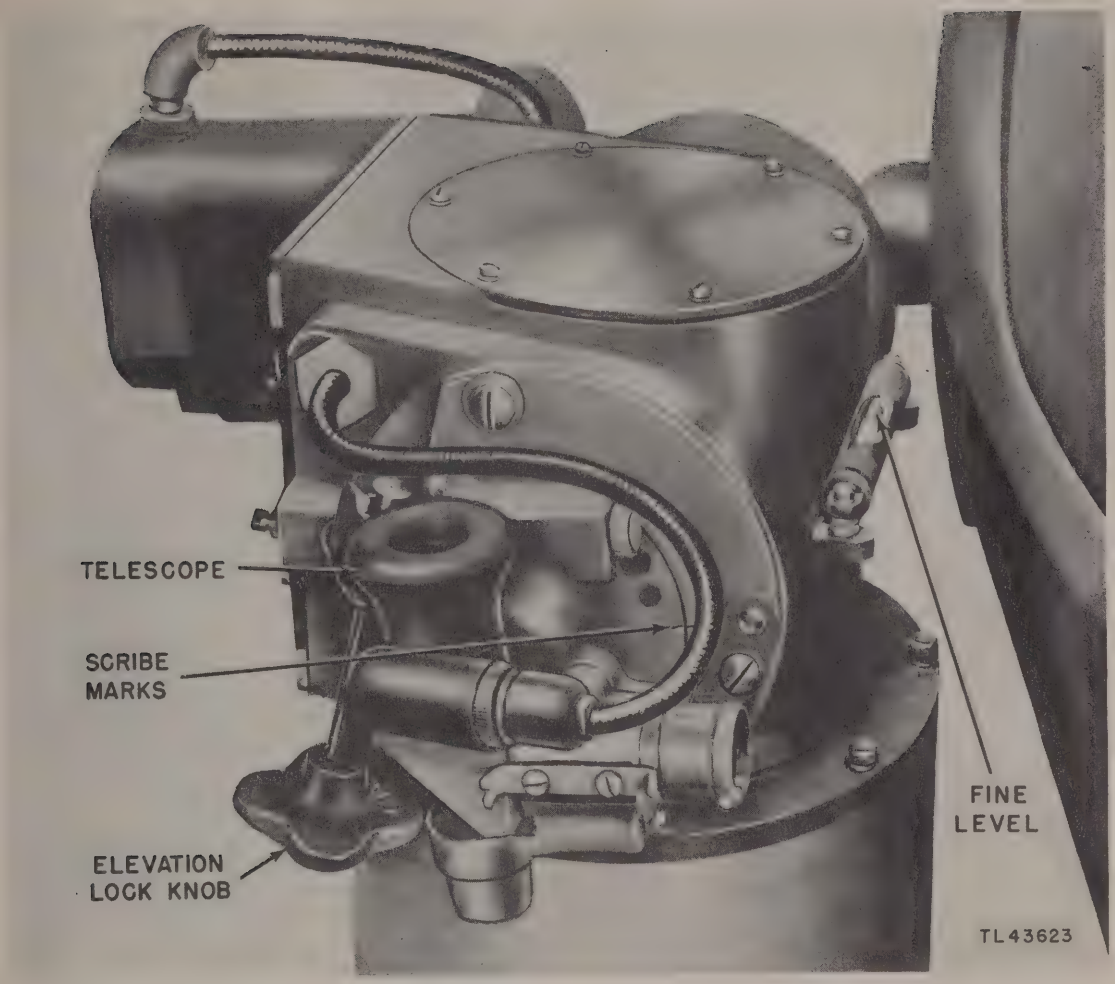

Figure 51. Rotating head, top of pedestal column.

board under the jackfeet to prevent the jackfeet from sinking into the ground.

(3) Disengage the right, or front, wheel assembly (fig. 45) by loosening the wingnuts and swinging the eyebolts outward. This will allow the adapters to be disengaged from the shoes attached to the right end of the console cabinet (fig. 45).

(4) Disengage the left, or rear, wheel assembly (fig. 48) by sliding back the sleeves and lifting the tops of the sockets (fig. 47). Pull one socket off the ball support and place it *above* the ball by springing it out and pulling upward. Pull the other socket off the ball support and let it remain *under* the ball. This will allow the wheel assembly to be disengaged from the pin assembly attached to the left end of the console cabinet (fig. 53).

(5) Remove the telescope canvas cover, antenna

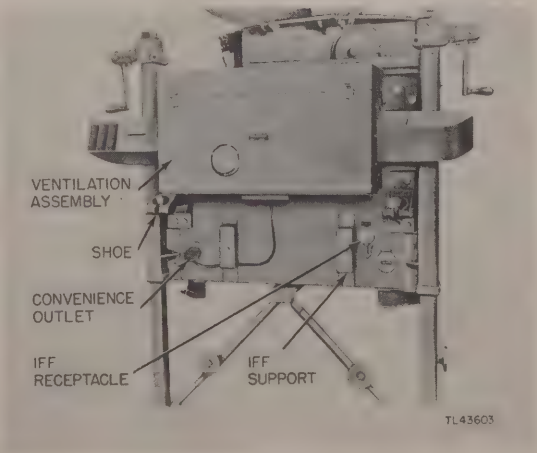

Figure 52. Radar Set AN/TPL–1, right end view.

cover, and guard. To remove the guard, loosen the clamp at the base of the antenna shank near the paraboloid, and open the guard by lifting one side (fig. 49).

(6) Disengage the AZIMUTH LOCK located on

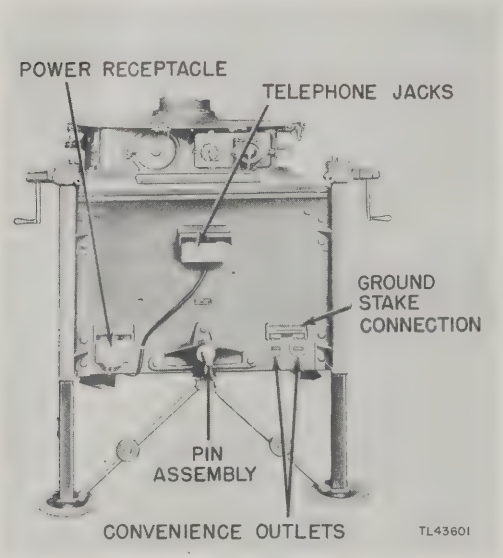

Figure 53. Radar Set AN/TPL–1, left end view.

the pedestal (fig. 50), and loosen the ELEVATION LOCK located on the rotating head of the pedestal (fig. 51).

CAUTION: If the set is to be moved later, the azimuth lock must be reengaged and the elevation lock must be tightened.

(7) Loosen knobs on jack struts and extend the jacks fully until the radar set is approximately level, as indicated by the coarse levels mounted on one corner of the pedestal (figs. 50 and 19). Then, while one man observes the fine level located on the rotating head (fig. 51) and another rotates the head in azimuth, a third man adjusts the jacks until the bubble remains stationary during one complete revolution.

(8) Tighten the knobs on the jack struts (fig. 45).

(9) Check to see that the cable from the ventilation assembly (fig. 52) is plugged into the convenience outlet on the cabinet.

(10) Install the IFF equipment on the support brackets mounted on the right end of the console cabinet (fig. 52). Plug the cable into the IFF receptacle and set up the antenna in the selected site.

(11) Drive the ground stake into the earth near one jack. Attach the lead on the stake to the cabinet (fig. 53).

(12) Connect the data cable CX–274/TPL–1 from the receptacle on the base of the pedestal (fig. 50) to the searchlight. See appendix I for details.

(13) Connect the power cable from the power unit to the POWER receptacle on the left end of the cabinet (fig. 53).

(14) Remove the rear center cover from the console cabinet and check the oil gauge on the azimuth and

Figure 54. Attaching tent poles.

elevation gear drive housing (figs. 70 and 17). If the level of oil is ⅛ inch below the top of the gauge, replenish the oil according to TM 11–1452.

(15) If the outside temperature is consistently above 32°F, set the WINTER-SUMMER switch (fig. 30) to SUMMER. Otherwise set it to WINTER.

(16) Attach a tent pole to each clevis on the pedestal base (figs. 50 and 54).

(17) Open the slide fastener at the rear of the tent and fit the tent over the framework of the poles to the top of the pedestal base. Close the slide fastener and strap the tent around the pedestal base.

NOTE: If the tent fly is to be used (fig. 55), open the slide fastener at the rear of the tent and snap the fly

Figure 55. Tent, with fly, rear view.

to the rings fastened near the center of the tent. Support it using tent poles, ropes, and stakes.

(18) Insert the air inlet pipe through the side of the tent and fit it to the ventilation assembly, strapping the boot around it.

(19) Recheck the bubble level on the rotating head (fig. 51) and readjust the jacks, if necessary.

NOTE: The steps involved in orienting and synchronizing Radar Set AN/TPL–1 with 1941 and 1942 60-inch antiaircraft searchlights are given in appendix I.

CHAPTER 3
OPERATION

SECTION I
STARTING PROCEDURE AND ADJUSTMENTS

49. PRELIMINARY STEPS.

a. Check to see that all operating switches and controls on the radar set, with the exception of the LIGHTS switch and BLOWER switch, are in the OFF, LOW, or MANUAL position. When a 1942 searchlight is being used, all circuit breakers should be in the ON position. All circuit breakers, except the SEARCHLIGHT & DATA TRANS. switch (fig. 56), should be in the ON position if a 1942 light is *not* being used.

b. If cabinet heating is not desired, turn the CABINET HEATER circuit breaker, located on the breaker panel at the rear of the cabinet, to OFF (fig. 32).

c. Start the power unit (see TM 11–975), and check to see that the voltages and frequencies are of the proper values.

d. Check to see that:

(1) The AZIMUTH LOCK is in the OUT position.
(2) The ELEVATION LOCK is loose.
(3) All cover plates are fastened in place.
(4) All doors are closed and fastened.

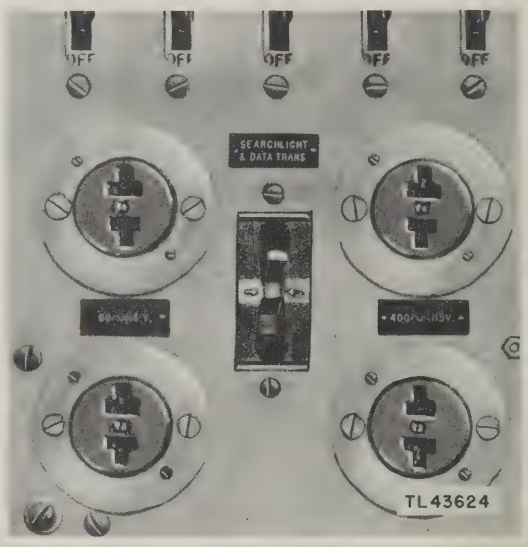

Figure 56. Section of circuit breaker panel.

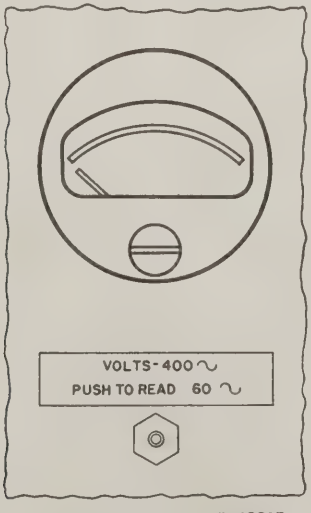

Figure 57. Starting procedure, step No. 1.

50. STARTING PROCEDURE.

STEP NO. 1

Check the voltage indicated on the voltmeter located on the front left panel of the cabinet (fig. 57). When the button beneath the meter is not depressed, the meter indicates 400-cycle, 115 volts ±5 volts.

STEP NO. 2

Check the 60-cycle voltage, which should be 115 volts (±10 volts), by depressing the button under the voltmeter (fig. 58).

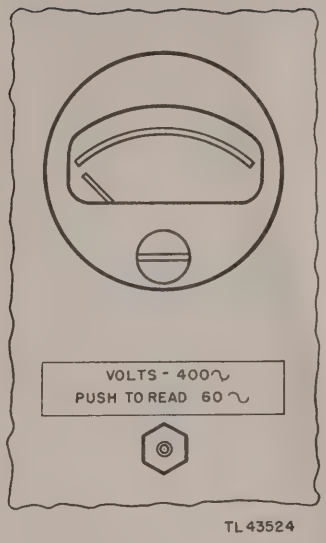

Figure 58. Starting procedure, step No. 2.

STEP NO. 3

Turn the 60-cycle POWER ON-OFF switch (fig. 59) to the ON position. The blue pilot light above the 60-cycle switch glows. The magnetron blower motor and the modulator blower motor start, but because of extraneous noises the motors may not be heard.

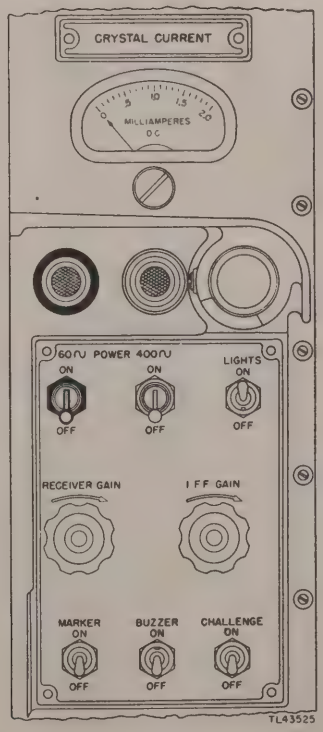

Figure 59. Starting procedure, step No. 3.

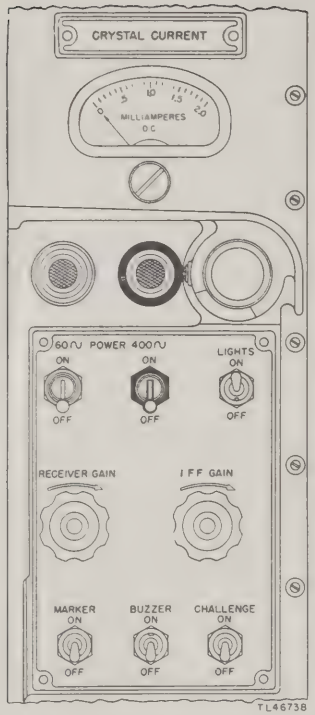

Figure 60. Starting procedure, step No. 4.

STEP NO. 4

a. Turn the 400-cycle POWER ON-OFF switch (fig. 60) to the ON position. The amber light above the switch will glow. The spinner motor starts and the antenna dipole spins. If the spinner motor hums and does not start, hold the SPINNER MOTOR switch (fig. 50) ON until the motor starts.

CAUTION: Perform steps one and two again. Also perform steps one and two when the tone of the noise made by the spinner motor changes to a lower pitch (about 30 seconds after starting).

b. After about 20 seconds the CRYSTAL CURRENT meter will indicate the crystal current. Sweeps will appear on the range and PPI scopes and tracking indicators. The green pilot lamp above the TRANSMITTER POWER ON-OFF switch will glow, after a 65-second delay. About 40 seconds after the green light glows the red pilot lamp will light.

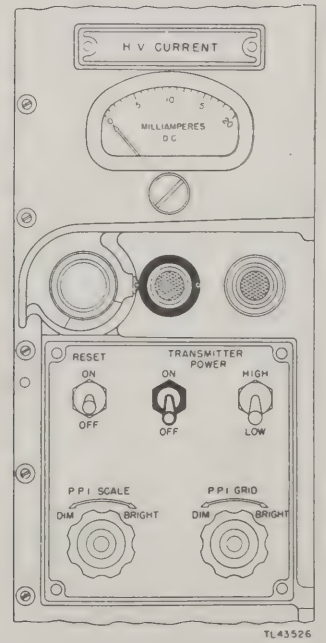

Figure 61. Starting procedure, step No. 5.

STEP NO. 5

Turn the TRANSMITTER POWER ON-OFF switch (fig. 61) to ON when the green pilot lamp lights. Low power is now available at the transmitter, and the H.V. CURRENT meter indicates 8-10 milliamperes, if the HIGH-LOW switch is in the LOW position.

NOTE

NOTE: If the overload relay trips (the green pilot lamp goes out), turn the TRANSMITTER POWER ON-OFF switch to OFF, and reset the circuit breaker by depressing the button marked RESET (fig. 62). Then repeat step No. 5.

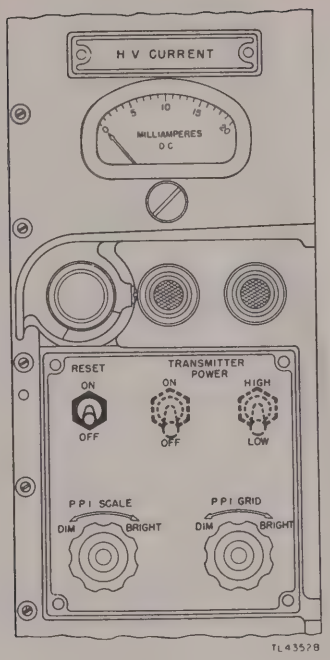

Figure 62. Starting procedure, steps No. 5 and 6, NOTE.

STEP NO. 6

a. When the red pilot lamp comes on, turn the TRANSMITTER POWER HIGH-LOW switch to HIGH (fig. 63). The H.V. CURRENT meter will now read 12-15 milliamperes, indicating that the radar set is operating under high power.

b. Perform steps one and two again.

NOTE: If the overload circuit breaker trips (the red and green pilot lamps go out), turn the TRANSMITTER POWER HIGH-LOW switch to LOW. Reset the circuit breaker by depressing the button marked RESET (fig. 62). Then repeat step No. 6.

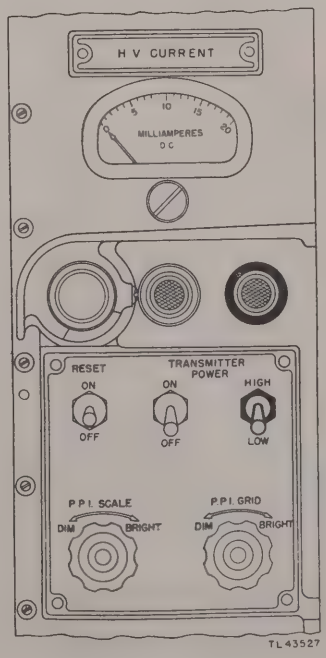

Figure 63. Starting procedure, step No. 6.

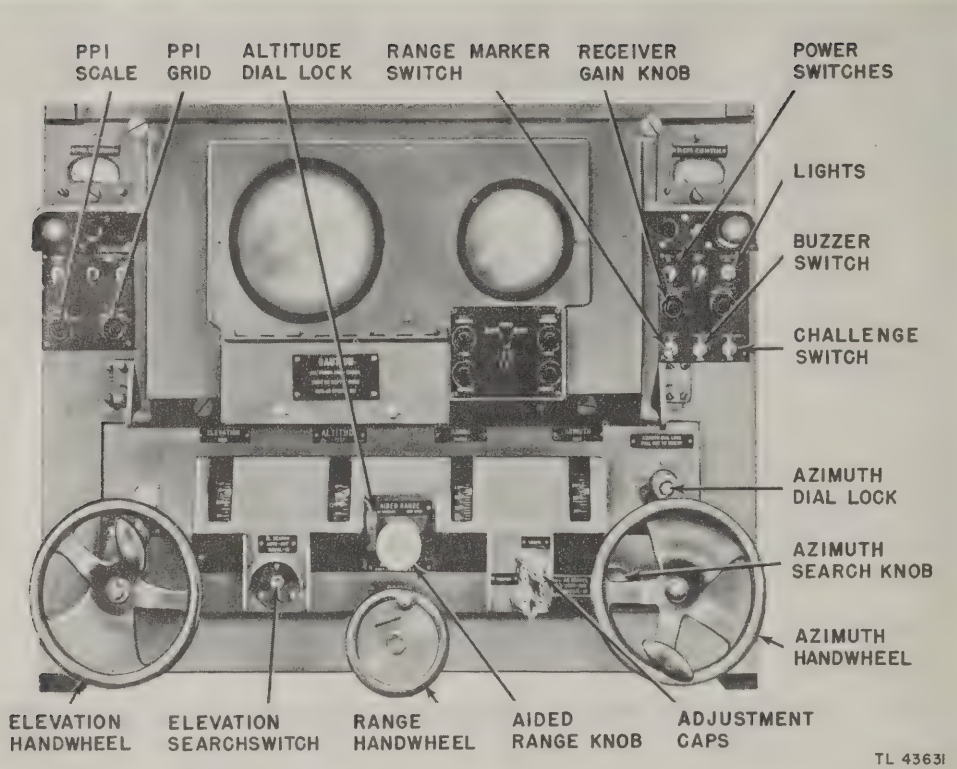

Figure 64. Main Drive Assembly MX–186/TPL–1, and Range Indicator Unit ID–81/TPL–1.

51. ADJUSTMENTS.

The adjustments for Radar Set AN/TPL–1 have, for convenience, been divided into two groups: operating adjustments and tuning adjustments. In general, the operating adjustments are those adjustments which may be required when the equipment has just been started, or during operation. The tuning adjustments are a separate group of controls which require less frequent setting. These adjustments will be made at the discretion of the person in charge.

a. Operating Adjustments. The operating adjustments are the simple adjustments made in the normal operation of the radar set.

(1) PPI INDICATOR — INTENSITY. Push in and turn the PPI INDICATOR—INTENSITY knob (fig. 65) clockwise until the sweep appears on the PPI scope.

(2) PPI INDICATOR — FOCUS. Push in and vary the PPI INDICATOR—FOCUS knob (fig. 65) until the sweep on the PPI scope is sharp.

(3) RANGE INDICATOR—INTENSITY. Push in and turn the RANGE INDICATOR—INTENSITY knob (fig. 65) clockwise until the sweep appears on the range scope screen.

(4) RANGE INDICATOR — FOCUS. Push in and vary the RANGE INDICATOR—FOCUS knob (fig. 65) until the sweep on the range scope is sharp.

(5) CRYSTAL CURRENT. Observe the reading of the CRYSTAL CURRENT meter (fig. 68). If the reading is between 0.4 and 0.6 milliampere, it is within satisfactory limits. If the reading is not between 0.4 and 0.6 milliampere, make the adjustments described in paragraph 51b(7).

(6) RECEIVER GAIN. Turn the RANGE GATE LEVEL ADJ. knob (fig. 68) all the way counterclockwise. Then turn the RECEIVER GAIN knob (figs. 64 and 35) clockwise until 1/8- to 1/4-inch of grass (noise) appears on the range scope sweep.

(7) RANGE GATE LEVEL ADJUSTMENT. Turn the RANGE handwheel (fig. 64) so that the range pedestal is at a clear (no-target) position on the range scope. Then vary the RANGE GATE

LEVEL ADJ. knob (fig. 68) until pips 1/16-inch high appear on the tracking indicators.

(8) LOCAL OSCILLATOR. Rotate the AZIMUTH and ELEVATION handwheels (fig. 64) so as to aim the paraboloid at a fixed target. Vary the LOCAL OSCILLATOR knob (fig. 68) until the height of the target echo on the range scope is at a maximum. Crystal current must be indicated on the CRYSTAL CURRENT meter at all times when tuning the LOCAL OSCILLATOR.

NOTE: Perform this adjustment 15 minutes after the set is started and at intervals of approximately 30 minutes thereafter.

b. Tuning Adjustments. These adjustments are not as readily accessible and, in general, require less frequent adjustment than the operating adjustments.

(1) RANGE INDICATOR (fig. 65).

(*a*) Turn the YARDS switch to 60,000.

(*b*) Loosen the two Dzus fasteners securing the door under the PPI scope, and remove the screwdriver clipped to the back of the door (fig. 65).

(*c*) Adjust control marked RANGE INDICATOR —VERT. ADJUST. until the sweep on the range scope is centered vertically.

(*d*) Turn the control, RANGE INDICATOR—HOR. ADJUST. until the large vertical transmitter pulse is positioned on the extreme left of the range scope screen.

(*e*) Turn the MARKER switch, located on the small panel to the right of the range indicator unit (fig. 35), to ON. Then turn the RANGE INDICATOR—60,000 LENGTH control (fig. 65) until the sixth range marker is visible on the extreme right of the range scope screen (fig. 12).

(*f*) Turn the RANGE handwheel (fig. 64) until the range pedestal is between the second and third markers. Readjust the RANGE INDICATOR—FOCUS control (fig. 65) until the sweep is sharp.

(*g*) Turn the YARDS switch to 30,000 (fig. 65).

(*h*) Turn the RANGE INDICATOR—30,000 LENGTH until the third marker is visible on the extreme right of the range scope screen.

(*i*) Replace the screwdriver, close and fasten the door under the PPI scope (fig. 65).

(2) PPI INDICATOR (fig. 65).

(*a*) Turn the YARDS switch to 60,000.

(*b*) Loosen the two Dzus fasteners securing the door under the PPI scope and remove the screwdriver clipped to the back of the door (fig. 65).

(*c*) While turning the AZIMUTH handwheel (fig. 64), adjust the PPI INDICATOR—60,000 CENTER control (fig. 65) so that the sweep starts from the same point around the entire 6,400 mils.

(*d*) If this starting point is not in the center of the scope, loosen the four large slotted thumbscrews on the range indicator unit (fig. 64), and lower the large front door. Turn the screwdriver adjustments (fig. 66) on the right and left sides of the PPI scope (fig. 66) until the starting point of the trace is in the center of the scope. Close the door and tighten the thumbscrews.

(*e*) Turn the range MARKER (figs. 35 and 64)

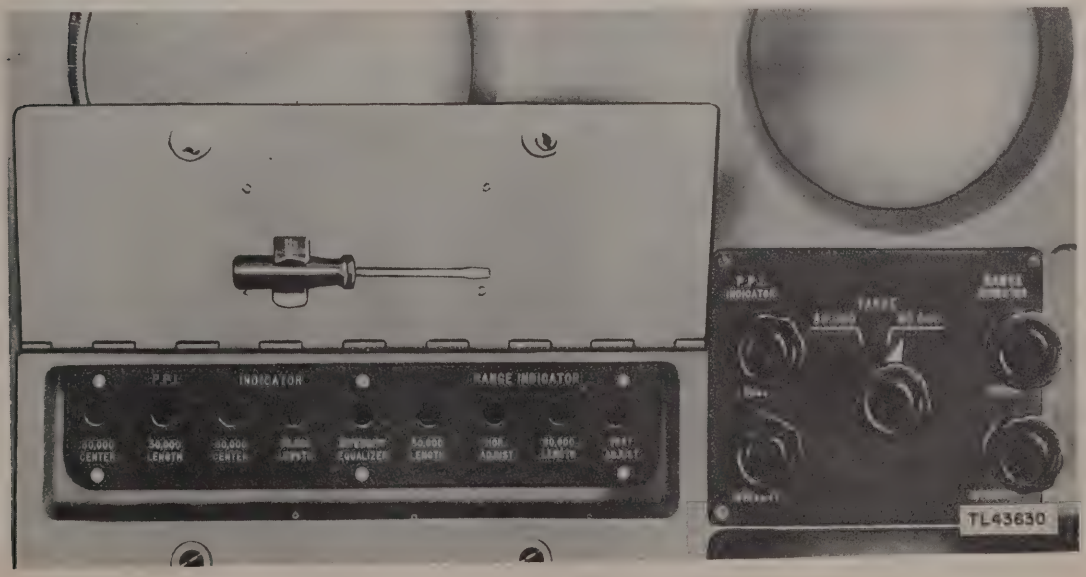

Figure 65. Range and PPI scope adjustments.

switch to ON, and vary the PPI INDICATOR—60,000 LENGTH adjustment (fig. 65) until the sixth marker is just within the azimuth scale (fig. 12).

(*f*) Readjust the PPI INDICATOR — 60,000 CENTER and 60,000 LENGTH controls (fig. 65). Turn the MARKER switch to OFF (fig. 64).

(*g*) Turn the YARDS switch to 30,000 (fig. 65).

(*h*) While turning the AZIMUTH handwheel,

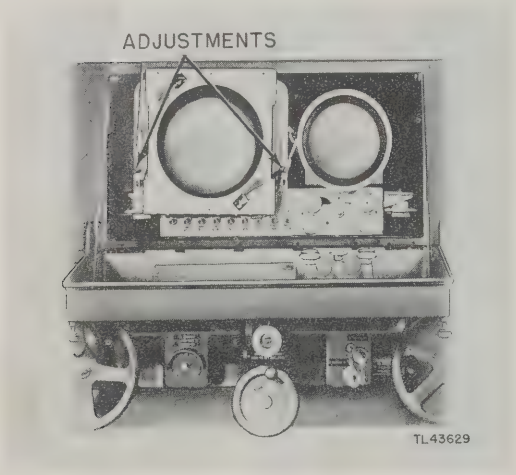

Figure 66. PPI scope, mechanical adjustments.

adjust the PPI INDICATOR—30,000 CENTER control until the sweep always starts from the same point.

(*i*) With the range MARKER switch ON, vary the PPI INDICATOR—30,000 LENGTH adjustment (fig. 65) until the third marker is just within the azimuth scale.

(*j*) Readjust the 30,000 CENTER and 30,000 LENGTH controls. Turn the MARKER switch to OFF (fig. 64).

(*k*) Adjust the INTENSITY EQUALIZER potentiometer (fig. 65) so that, when switching from 30,000 to 60,000 and back to 30,000 yards, the sweep intensities are the same.

(3) TRACKING INDICATORS (TRACKING SCOPES) (figs. 14 and 67).

(*a*) Loosen the Dzus fasteners which secure the doors of the azimuth and elevation tracking indicators and swing the doors open (fig. 67).

(*b*) Vary the VERT CENT, HOR CENT, FOCUS, and INT adjustments (fig. 67) until the sweep trace on each indicator is properly positioned and clearly defined.

(*c*) Replace the screwdriver in the clip attached to the door under the PPI scope and fasten all doors on the cabinet (fig. 65).

(4) AZIMUTH DIAL ORIENTATION (fig. 64).

(*a*) Rotate the AZIMUTH handwheel until the AZIMUTH dial reads either zero mils or that angle of the azimuth which has been chosen as the azimuth reference point.

(*b*) Pull out the knob marked AZIMUTH DIAL LOCK (fig. 64) and, while one man uses the telescope on the rotating head (fig. 51), rotate the AZIMUTH handwheel until the antenna points north or to the chosen reference point.

(*c*) Release the AZIMUTH DIAL LOCK knob by pushing it in.

(5) ALTITUDE DIAL SETTING (fig. 64).

(*a*) Set the AZ. SEARCH and EL. SEARCH controls to the MANUAL IN position by pushing them in.

(*b*) Move the RANGE and ELEVATION handwheels until the ALTITUDE dial reads the known height of the radar set above sea level.

(*c*) Pull out the ALTITUDE DIAL LOCK knob (fig. 64), and rotate the ELEVATION handwheel until the ELEVATION dial reads zero.

(*d*) Push in the ALTITUDE DIAL LOCK.

(6) RANGE DIAL CALIBRATION (fig. 64).

(*a*) Set the YARDS switch (fig. 65) to 60,000.

(*b*) Rotate the RANGE handwheel until the RANGE dial indicates 10,000 yards.

(*c*) Unscrew the caps from the POSITION and LENGTH adjustments located below the RANGE and AZIMUTH dials (fig. 64).

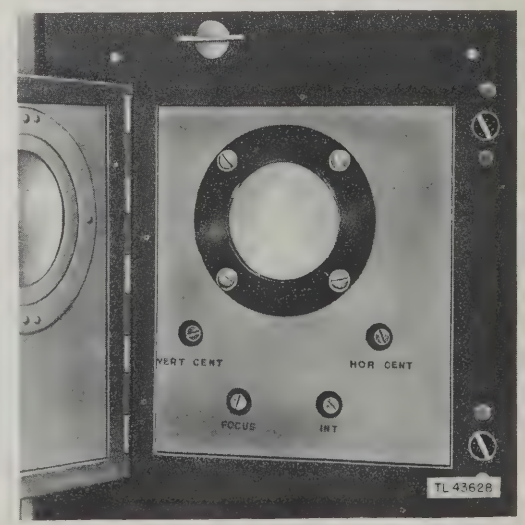

Figure 67. Tracking Indicator ID–82/TPL–1, adjustments.

(*d*) With a screwdriver, turn the POSITION adjustment until the left edge of the range pedestal is placed at the 10,000-yard marker on the range scope.

(*e*) Rotate the RANGE handwheel until the RANGE dial indicates 50,000 yards.

(*f*) Vary the LENGTH adjustment until the left edge of the range pedestal is at the 50,000-yard marker.

(*g*) Check to see that the left edge of the pedestal is still placed at the 10,000-yard marker when the RANGE dial reads 10,000. If necessary repeat steps (*d*), (*e*), and (*f*) above.

(*h*) Replace the caps which cover the two adjustments.

(7) KLYSTRON OSCILLATOR (fig. 68).

(*a*) If the klystron is not oscillating, the CRYSTAL CURRENT meter will read zero and the following steps must be performed to produce oscillation. If the CRYSTAL CURRENT meter indicates a reading, but the reading is not within the specified limits, the following steps will also provide a satisfactory reading. To start the tube oscillating, first open the large door on the front of the right-end section of the cabinet.

(*b*) Turn the LOCAL OSCILLATOR knob on the front of the receiver to midposition.

(*c*) Through this door, set the GRID knob on the receiver to its midposition.

(*d*) Adjust the REFLECTOR control until the CRYSTAL CURRENT meter indicates maximum current.

(*e*) Readjust the GRID control until the CRYSTAL CURRENT meter indicates maximum current.

(*f*) If the CRYSTAL CURRENT meter does not then indicate between 0.4 and 0.6 milliampere, adjust the crystal mixer coupling. To do this, remove the handhole cover on the top of the left end of the cabinet (fig. 69). Loosen the knurled locknut on

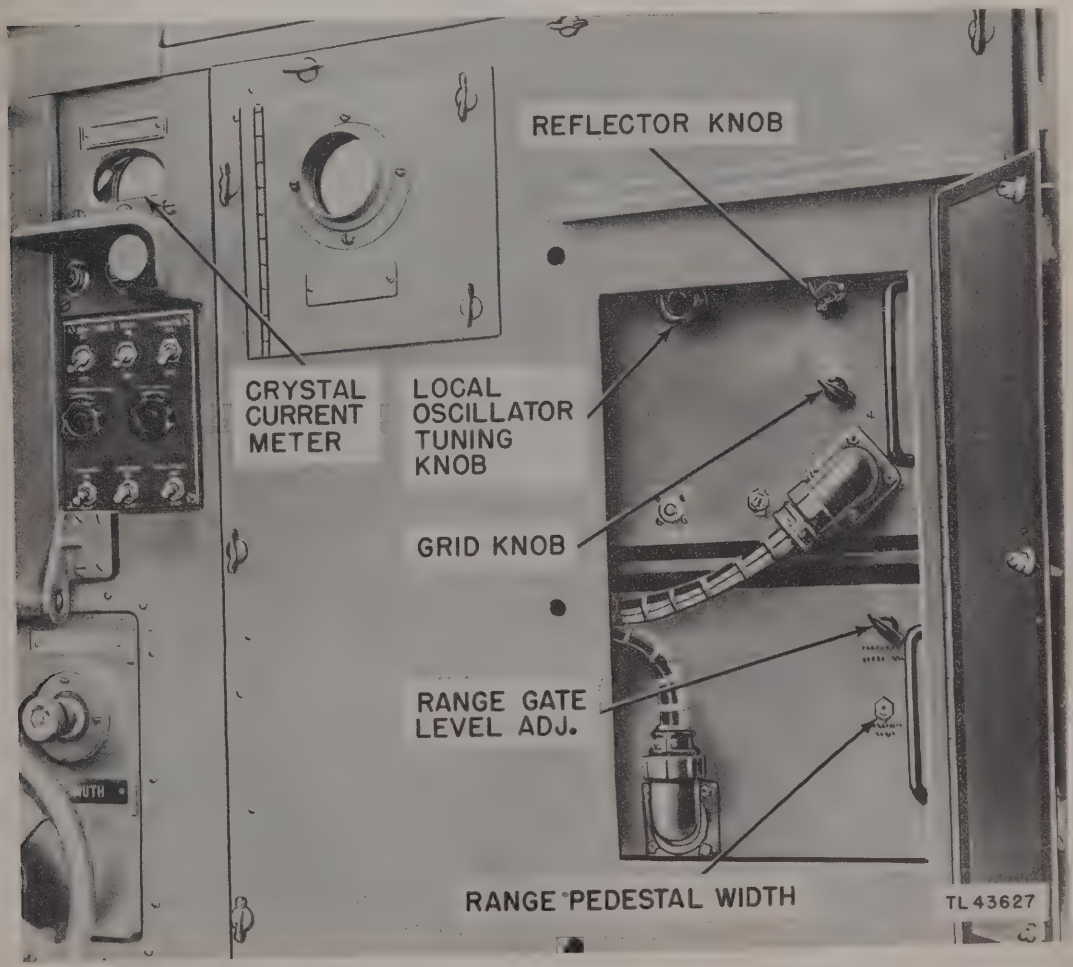

Figure 68. Receiver and synchronizer adjustments.

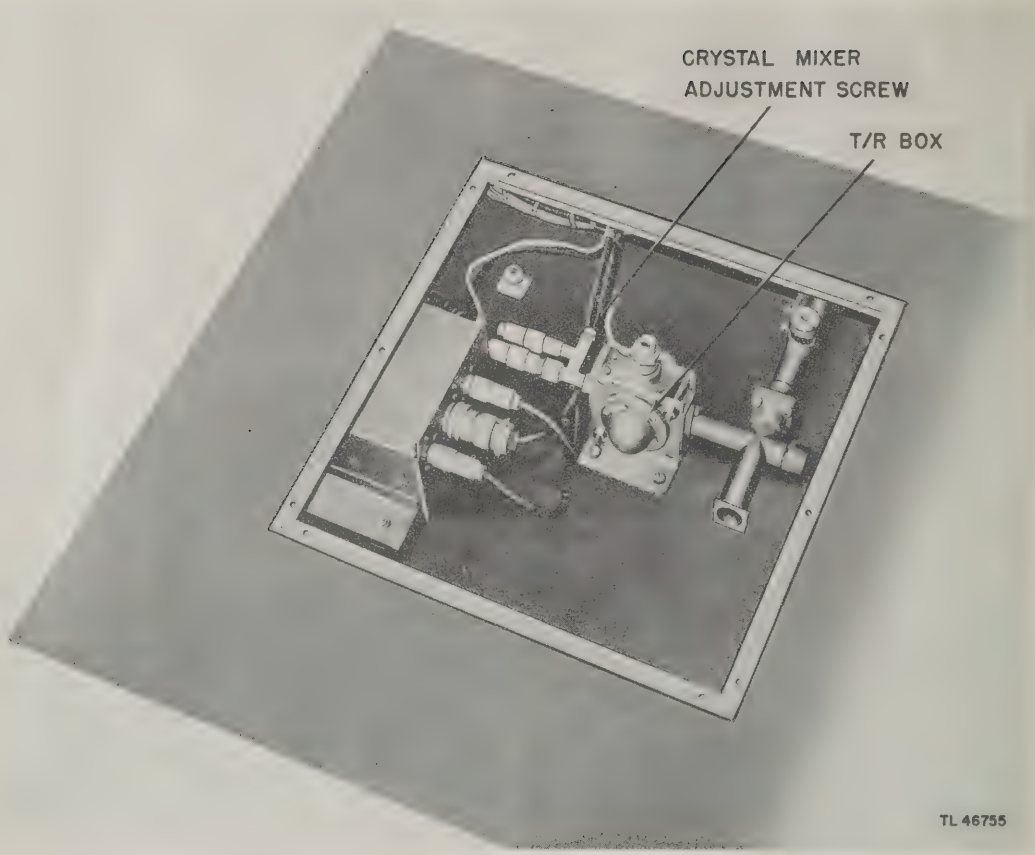

Figure 69. View through left top handhole.

the crystal mixer. Turn the knurled screw (fig. 69) until the CRYSTAL CURRENT meter reads approximately 0.5 milliampere. Tighten the knurled locknut. Replace the handhole cover.

(*g*) Rotate the AZIMUTH and ELEVATION handwheels (fig. 64) so as to aim the paraboloid at a fixed target. Vary the LOCAL OSCILLATOR knob until the height of the target echo on the range scope is a maximum. Recheck reading of CRYSTAL CURRENT meter.

(*h*) If the preceding steps do not produce a satisfactory target height and a satisfactory reading on the CRYSTAL CURRENT meter, the T/R box should be tuned. T/R box tuning is not an operating procedure, and must be performed only under the direction and at the discretion of the person in charge. See TM 11–1552 for tuning procedure.

c. Elevation Search Sector Adjustment (figs. 70 and 17).

(1) Loosen the fasteners and open the door on the rear center panel of the radar set.

(2) Pull out the index pin of the index dial as far as it will go (fig. 70). Twist it in either direction so that it will stay out.

(3) Move the pin in a circle (around the shaft on which the cams are mounted) until the scan SECTOR pointer points to the value representing the size of the sector desired.

(4) Twist the pin so that it springs inward, but do not allow it to go all the way in. Let it go in far enough so that, when it is turned in a circle, the

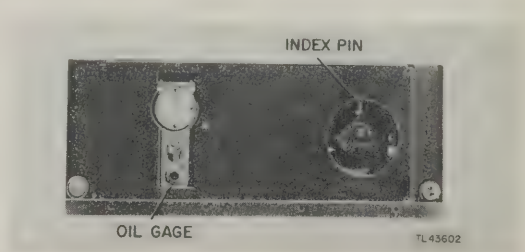

Figure 70. Elevation sector cams and oil gauge.

SCAN LOWER LIMIT pointer also turns.
(5) Move the pin in a circle until the SCAN LOWER LIMIT pointer points to the value representing the desired lower limit of the scan.
(6) Allow the pin to snap in all the way. Check to see that it is engaged by trying to move it in a circle. It is engaged if it cannot be moved.
(7) Check to see that the pointers indicate the values desired.
(8) Close and secure the door protecting the cams.

SECTION II
TECHNICAL OPERATION

52. AUTOMATIC SEARCH.

After the set has been placed in operation and adjustments have been made, automatic search may be used.

a. The steps in preparing the set for automatic search are as follows:
(1) Pull the AZ. SEARCH knob (fig. 64) out to the AUTO position.
(2) Pull the EL. SEARCH switch (fig. 64) out to the AUTO position.
(3) Set the YARDS switch to 60,000 (fig. 65).
(4) The radar set now is searching automatically through 360 degrees (6,400 mils) in azimuth and through a predetermined elevation sector. Any targets present, within 60,000 yards of the radar set, will be indicated on the PPI and range scopes (figs. 71, 72, and 12).

(*a*) As the paraboloid rotates, fixed echos will appear on the PPI and range scopes particularly at low elevations. These fixed echos should be noted for future reference.

(*b*) Echos from aircraft targets will appear on the PPI scope as bright dashes which move in azimuth and range. Echos from aircraft at ranges greater

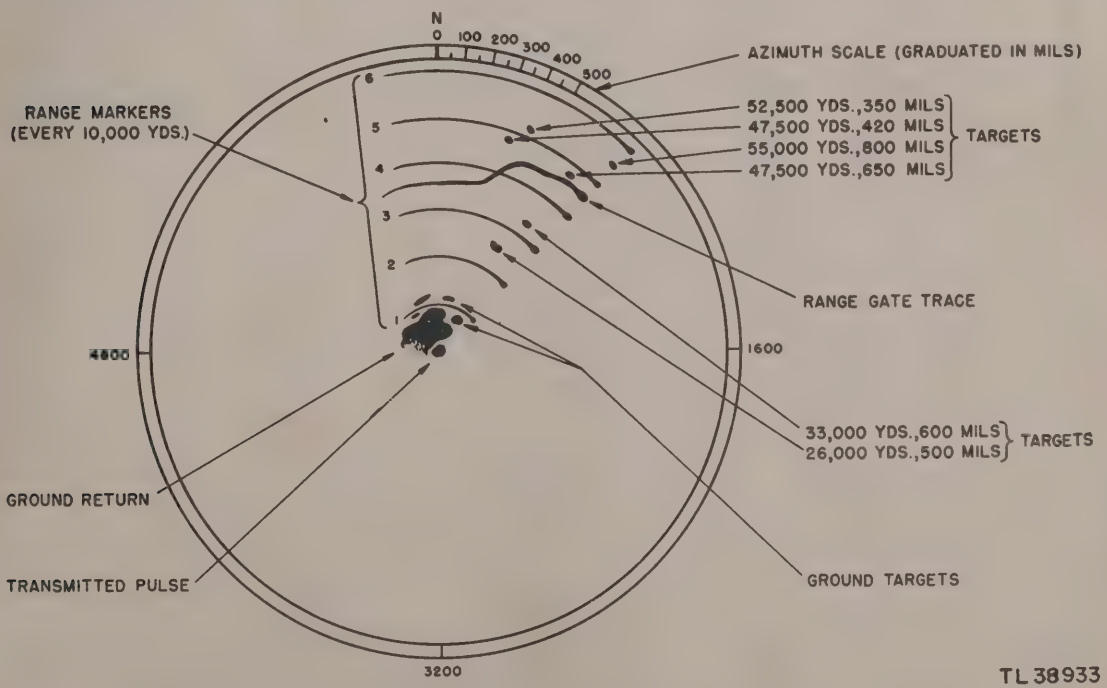

Figure 71. Typical pattern on PPI scope.

than 30,000 yards usually appear at elevation angles of about 50 to 100 mils.

(*c*) By watching the PPI scope and elevation dial, differentiation between ground and aircraft targets is possible.

(*d*) In order to prevent the hiding of targets, set the range pedestal at some point which is free of

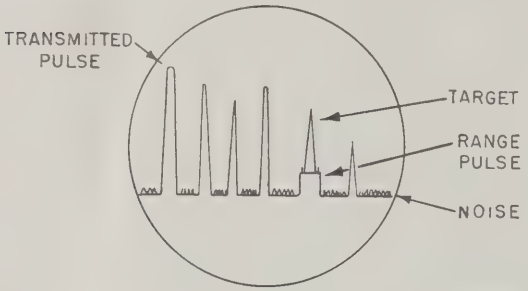

Figure 72. Typical pattern on range scope.

targets and fixed echos by rotating the RANGE handwheel (fig. 64).

(5) Azimuth position and grid coordinates may be read from the PPI scope if the corresponding overlays are illuminated. To illuminate the azimuth scale, turn the knob marked P.P.I. SCALE located on the small panel to the left of the PPI scope (fig. 64). To illuminate the grid overlay, turn the knob marked P.P.I. GRID located on the same panel (fig. 64). The level of illumination may be varied according to the setting of the knobs. Switching from one grid to another is performed automatically when range is changed.

(6) Range markers appear on the PPI and range scopes only when the MARKER switch (fig. 64) is turned to ON. The range markers may be used to approximate the slant range of the target and to aid in placing the range pedestal under the correct target.

(7) Grid coordinate data, azimuth position, and approximate range may be read from the PPI scope. When manual tracking begins, elevation, azimuth, range, and altitude may be read directly from the data dials also (fig. 11).

(8) If it is desired to search at a fixed angle of elevation, push in the EL. SEARCH switch to MANUAL and set the antenna at the desired elevation with the ELEVATION handwheel (fig. 64).

(9) To stop the automatic search, push in the AZ. SEARCH knob to MANUAL.

NOTE: If the radar set is searching in both azimuth and elevation, pushing in the AZ. SEARCH knob will stop both automatic operations.

53. MANUAL TRACKING.

When the target comes close enough (usually 30,000 yards or less) to the radar set, manual tracking may be substituted for the automatic search.

a. The manual tracking procedure is as follows:

(1) If the range is less than 30,000 yards, turn the YARDS switch to 30,000 (fig. 65).

(2) Push in the AZ. SEARCH knob to MANUAL (fig. 64) when the PPI sweep is near the azimuth position of the target.

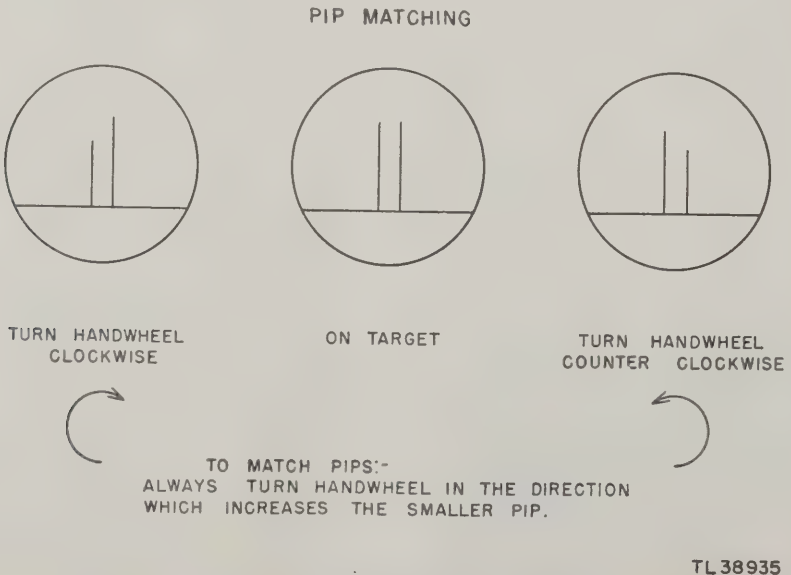

Figure 73. Typical patterns on tracking indicators.

(3) Rotate the AZIMUTH and ELEVATION handwheels to the approximate azimuth and elevation position of the target. Continue rotating until the target echo is of maximum height on the range scope.

(4) Rotate the RANGE handwheel to bring the range pedestal under the target. Tracking signals will appear on the tracking scopes (fig. 73).

(5) Track the target by rotating the AZIMUTH and ELEVATION handwheels to match pips on the tracking scopes. Always turn the handwheel clockwise when the right pip is highest and counterclockwise when the left pip is highest, until the pips are of equal height (fig. 73).

(6) Keep the pedestal under the target echo. This may be done by rotating the RANGE handwheel or by using the aided range. To use aided range, push in the AIDED RANGE knob (fig. 64) and rotate it until the range pedestal travels at the same rate as the target. Hold the knob in this position. Readjust the aided range as necessary while following the target. To stop the aided range, pull out the AIDED RANGE knob.

b. To use the IFF, hold the CHALLENGE switch, located on the small panel to the right of the range scope (fig. 64), in the ON position.

c. To operate the signal buzzer, push the BUZZER switch to the ON position (fig. 64).

SECTION III
STOPPING PROCEDURE

54. NORMAL STOPPING.

The following procedure is recommended for turning off the set.

a. Turn the TRANSMITTER POWER switches (fig. 34) to LOW and OFF.

b. Turn the 60-cycle and 400-cycle POWER switches (fig. 35) to OFF.

c. Set all operating controls to OFF or MANUAL.

d. Stop the power unit according to directions in TM 11–975, unless cabinet heating and ventilation are desired.

55. EMERGENCY STOPPING.

In an emergency, it may be necessary to turn off the set in the shortest possible time. To do this simply turn the 60-cycle and 400-cycle POWER switches to OFF (fig. 35). Before starting the set again be sure that the procedure outlined in paragraphs 49 and 50 is followed.

CHAPTER 4
EQUIPMENT PERFORMANCE LOG

SECTION I
GENERAL INFORMATION

56. EQUIPMENT PERFORMANCE LOG.

a. General. An Equipment Performance Log has been developed to insure the most efficient technical operation of Radar Set AN/TPL–1. The front of the log sheet is shown in figure 74. Regular and conscientious use of this *chart of technical operation* will assure the most efficient functioning of the radar set.

b. Function of the Log Sheet. The Equipment Performance Log has several functions, as follows:

(1) It directs routine and systematic checks of the equipment performance while the set is on the air, and eliminates careless and haphazard methods of technical operation.

(2) It presents the conditions of normal equipment performance and indicates the operating tolerances outside of which meter readings should not be permitted to go, except under circumstances of emergency.

(3) It reveals the signs of abnormal functioning and indicates the need for the application of corrective measures. It trains operating personnel to recognize the evidences of abnormality and to apply corrective measures where possible while the set is on the air.

(4) It aids in the prevention of major break-downs. When signs of irregular operation are discovered, total break-down may often be avoided if the set is turned off immediately and the necessary repair is made.

(5) It provides complete records of equipment performance, since checks are required several times during the operating period of the day. This visible record gives each succeeding watch an itemized picture of the functioning of all components. The more important information on the log may be transferred each day to the Station Record Book, where it can be studied when occasion demands.

57. DESCRIPTION OF THE LOG.

The Equipment Performance Log comes in pad form and consists of the following parts:

a. Abridged Instructions. For easy reference, an abridged and simplified form of the major instructions for using the Equipment Performance Log is given in the front of each log pad.

b. Log Sheets. There are 35 regular log sheets in each log pad. Each sheet is divided into sections. These sections are divided into items which appear on the front and the back of the sheet.

(1) FRONT OF LOG SHEET. The front of the log sheet (fig. 74) contains the heading, which consists of roman numeral items I through VII, and the main part of the log sheet, which consists of arabic numeral items 1 through 44. Items 1 through 44 may be grouped as indicated below:

(*a*) *Three-times Daily Items.* Items 1-5, 7, 9-11, 13-22, and 24-28 are filled in three times a day.

(*b*) *Blank Item Spaces.* These spaces are provided for item entries directed by the person in charge.

(*c*) *Operating Time Items.* Items 31 through 35 are filled in as required.

(*d*) *Weekly Summary Items.* Items 36, 37, and 38 are to be filled in once a week.

(*e*) *Signature of Person Keeping Log.* Items 39 through 43 provide space for the technician to sign his name and log the time he comes on and goes off duty.

(*f*) *Numbering Log Sheets.* Item 44 provides a space for numbering the log sheet.

(2) BACK OF LOG SHEET. The back of the log sheet (fig. 75) is divided into the following parts:

(*a*) *Heading.* Items I through VI form the heading.

(*b*) *Section A.* This space, labeled NOTES, is provided for the description of any abnormal condition and an explanation of the steps that were taken to correct that condition.

(*c*) *Sections B and C.* These spaces are provided for a report on the components and the parts installed or removed from the set. Section B is labeled COMPONENT RECORD; section C is labeled PART RECORD.

(*d*) *Section D.* This space is provided on the

back of the log sheet for such additional entries as are necessary.

58. GENERAL INSTRUCTIONS FOR FILLING IN THE LOG SHEET.

Specific instructions for filling in the separate items and sections of the log sheet are given in paragraph 60 of this chapter. However, the following general rules apply to filling in all items:

a. Normal Condition. The condition of the equipment is considered to be normal if it is operating within the normal tolerance value. Keep the set operating between the points designated by the instructions.

b. Log Entries. Make the proper entries on the log sheet at the correct time intervals and according to the instructions given for each item. Use one log sheet for each 7-day period. The reading *seen* is the one to be recorded on the log sheet, regardless of whether the reading is normal or abnormal. If an entry cannot be made, or if an abnormal condition is found while readings are being taken, enter an asterisk (*) in the appropriate space of the front of the log sheet. Notify the person in charge if the condition is likely to cause damage to equipment. On the reverse side of the log sheet in section A, explain the reason for the asterisk and state what was done to correct the condition. If an abnormal condition is discovered at any time other than when the readings are being taken, make a note in section A, but omit the asterisk on the front of the log sheet. In general, a meter reading is to be considered abnormal if it is not within the range of values (tolerances) shown in the brackets to the right of the item title on the front of the log sheet. In addition, any sudden shift in a meter reading, even though it is still within the tolerance range, is to be regarded with suspicion, investigated thoroughly, and explained in section A on the back of the log sheet.

c. Method of Making Entries. Make all entries with ink or indelible pencil if either is available. If a mistake is made, do not erase it. Cross out the incorrect entry, and make a new one above it. Do not use ditto marks. Write as neatly as possible; the log sheet is a part of the permanent record. Accuracy is of primary importance, and the entries must be legible enough to be used as a reference.

d. Optimum Values. Enter the optimum operating values, the meter indications that represent most efficient operation, to the right of the brackets in the column of empty parentheses provided.

e. Tolerances. Tolerances may be defined as the low and high values for normal operation. They appear in the brackets to the right of the item titles. Do not permit meter indications to go above or below the stated values. By using specified corrective measures and adhering to the indicated tolerances, operators will be able to keep break-downs at a minimum.

f. Limits. In certain tactical situations it may be necessary to keep the set on the air regardless of whether or not the set is performing satisfactorily. At such a time it is important for the technician to know at what point he may expect the radar set to fail. Limits, where known, will be found in the discussion of individual items.

g. Units. Make all entries in terms of the units (volts, degrees, hours, etc.) given in the last column of parentheses to the right of the item titles. The following symbols and abbreviations are used in the units column.

V	.....volts	Hr	.....hour
ma	.....milliamperes	Min	.....minutes
°F	.....degrees Fahrenheit	%	.....percent
Kyd	.....thousands of yards		

h. Italicized Items. Check the items printed in *italics* frequently. Keep these items under close watch; they tend to standardize operating conditions by providing a general check on the over-all efficiency of the equipment. Apply corrective measures whenever necessary.

i. Change-of-Watch Procedure. If log entries are required when one technician relieves another, both the incoming and outgoing technicians take a set of readings together. If it is not time to take log readings when the new shift reports for duty, the incoming technician checks the last set of readings with the technician being relieved. If the operation of the set is normal, the incoming technician signs the log sheet, thereby assuming responsibility for the performance of the radar station. If the operation is abnormal, make a note in section A, stating wherein the abnormality lies. Both technicians initial the entry in section A.

59. CORRECTIVE MEASURES.

Specific corrective measures to be taken while the set is on the air are not described in the log pad. Corrective measures are measures which can be taken while the set is on the air. These are described in the item writeups. Specific trouble-shooting procedures are given in TM 11–1552.

NOTE: Whenever corrective measures are not given and an item is abnormal, or when the corrective measures given do not correct the abnormal item, notify the person in charge.

SECTION II
SPECIFIC LOG PROCEDURES

60. METHOD OF FILLING IN FRONT OF LOG SHEET.

a. Heading.

(1) ITEM I, RADAR SET AND SERIAL NO. _____. Enter the serial number of the radar set. The serial number of the set is obtained from the nameplate on the left end of the cabinet.

Sample Entry:
I. Radar Set AN/TPL–1 Serial No. *37.*

(2) ITEM II, FREQUENCY ___ MEGACYCLES. Enter the assigned frequency in megacycles at which the set operates.

Sample Entry:
II. Frequency *(operating frequency)* Megacycles.

(3) ITEM III, ORGANIZATION. Enter the official designation of the company, platoon, regiment, or other organization charged with the operation of the radar set.

Sample Entry:
III. Organization *109 AAA Searchlight Battalion.*

(4) ITEM IV, ADDRESS. Enter the complete official mailing address of the organization.

Sample Entry:
IV. Address *Godstone, New Jersey.*

(5) ITEM V, LOCATION. Enter the geographical location of the radar station if within the continental limits of the U. S. A. Otherwise, leave the space blank.

Sample Entry:
V. Location *Twin Lights.*

(6) ITEM VI, DATES. Enter the dates covered by the log sheet.

Sample Entry:
VI. Dates: from *6 October* through *12 October* 1944.

(7) ITEM VII, SIGNATURE. After the log sheet has been completed, the person in charge of the radar set checks the log sheet and signs it.

Sample Entry:
VII. Signature *O. H. Franky, 1st Lt.*
Person in charge

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b. Main Body of Log.

ITEM 1, LOG STARTING TIME.
Sample Entry:

1 Log Starting Time	[A] ( ) (Hr.-Min.)	0800	1300	2230

Log Entry. Enter in the brackets to the right of the item title the suffix for the time zone in which the station is located. For instance, if the station is located in Italy, enter A. Obtain the *official time zone suffix* from the person in charge. Three columns (A, B, and C) are provided on the log sheet for each day's operation. Begin the first set of log entries in column A about 15 minutes after starting the radar set. Fill in column C shortly before shutting down the set. If the operating period is longer than 3 hours, make a set of entries in column B near the middle of the operating period.

ITEM 2, WEATHER CONDITIONS.
Sample Entry:

2 Weather Conditions	[ ] ( ) (Symbols)	O	O	F

Log Entry. Use one or more of the following symbols to indicate the general condition of the weather. In case of any unusual wind conditions or weather conditions, such as aurora (northern lights), not covered by these symbols, enter an asterisk (*) after the log entry and give a description of the condition and any effects on equipment performance under NOTES.

Weather conditions	Symbol	Weather conditions	Symbol
Clear sky	O	Rain	R
Overcast sky	●	Snow	S
Fog	F	Freezing Rain	ZR
Haze	H	Sleet	E
Smoke	K	Hail	AP
Dust	D	Thunderstorm	⚡
Mist	M	Lightning visible	↯

ITEM 3, TEMPERATURE OUTSIDE.
Sample Entry:

3 Temperature Outside	[ ] ( ) (°F)	25	29	40

Log Entry. Record in the log space to the nearest degree the outside temperature in degrees Fahrenheit.

ITEM 4, TEMPERATURE INSIDE.
Sample Entry:

4 Temperature Inside	[ ] ( ) (°F)	60	65	70

Log Entry. Record in the log space to the nearest degree the inside temperature in degrees Fahrenheit.

ITEM 5, HUMIDITY.
Sample Entry:

5 Humidity	[ ] ( ) (Abbrev.)	L	L	VH

Log Entry. Enter in the log space one of the following abbreviations, indicating the estimated humidity:

Very Low (air very dry)	VL
Low (air dry)	L
Moderate	M
High (air damp)	H
Very High (air very damp)	VH

In order to log the humidity it is necessary, in the absence of a hygrometer, to judge the humidity from the *feel* of the air and from its other effects. The humidity is probably high when: clothing feels damp; there is rain, fog, or haze (from water vapor); sweat fails to evaporate; moisture condenses on cold surfaces; the air seems warm and close, damp, or

muggy. The humidity is probably low when: the skin and lips chap, the air is cold and crisp, damp clothes dry quickly, visibility is good, or when the nasal passages are drier than usual.

ITEM 6, BLANK.

ITEM 7, POWER UNIT.
Sample Entry:

7 Power Unit (PU–35/U) [ ] ( ) ( )	OK	OK	N*

Log Entry. Enter in the parentheses to the right of the item title the nomenclature of the power unit in use. Enter OK in the log space if the power unit voltage is within the specified limits. If the power unit does not meet the above requirements enter N* and explain under NOTES.

ITEM 8, BLANK.

ITEM 9, LINE VOLTAGE.
Sample Entry:

9 *Line Voltage* [115 ±10 60 ~] [115 ±5 400 ~] ( ) (OK-N*)	OK	OK	N*

Log Entry. If the voltmeter (fig. 33) indication for 400-cycle power is between 110 and 120 volts and the 60-cycle power is between 105 and 125 volts enter OK. If it is not, enter N* and explain under NOTES. The meter normally indicates 400-cycle voltage. To read 60-cycle voltage depress the button below the meter. To correct the line voltage, notify the power-unit operator.

ITEM 10, HIGH-VOLTAGE CURRENT.
Sample Entry:

10 *H.V. Current* [8-10; 12-15 ma.] ( ) (Ma.)	16	17	10*

Log Entry. Record in the log space the reading of the H.V. CURRENT milliammeter (fig. 33) to the nearest milliampere. With the right-hand TRANSMITTER POWER HIGH-LOW switch on HIGH, the reading should be between 12 and 15 milliamperes. With the switch on LOW, the reading should be between 8 and 10 milliamperes. Place an N* after the reading entered on the log sheet when the high-voltage current is not normal.

Corrective Measures. If the high-voltage current is abnormal or not steady:

a. Check item 9, Line Voltage.

b. Check item 13, PPI Oscilloscope. Instability of the PPI timebase calls for trouble shooting in the transmitter trigger circuit during shut-down.

ITEM 11, CRYSTAL CURRENT.
Sample Entry:

11 *Crystal Current*	[0.4 to 0.6 ma.] ( ) (ma.)	0.5	0.5	0.7*

Log Entry. Enter the CRYSTAL CURRENT meter (fig. 33) reading to the nearest 1/20 ma. It should indicate between 0.4 and 0.6 ma. Place N* after the reading if it is not normal and explain under NOTES.

Corrective Measures. If the reading of the meter is not within the specified limits or is not steady:

a. Retune the local oscillator (par. 51 *b*(7)).

b. Readjust the coupling into the crystal mixer (par. 51 *b*(7) (*f*)).

c. Retune the T/R box. This is not an operating procedure. Notify the person in charge.

ITEM 12, BLANK.

ITEM 13, PPI OSCILLOSCOPE.
Sample Entry:

13 PPI Oscilloscope	[Oper. Cond.] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if PPI oscilloscope (fig. 12) is operating normally; enter N* if it is not and explain under NOTES. The PPI oscilloscope is operating normally if:

a. The PPI oscilloscope FOCUS control can be adjusted to obtain correct focus.

b. The PPI oscilloscope CENTER control can be adjusted to center the sweep trace on the screen.

c. The PPI oscilloscope INTENSITY control can be adjusted to produce a trace of proper brilliance.

d. The sweep is steady on the screen.

e. The number of range markers changes from three to six when the YARDS (range) switch is changed from the 30,000-yard position to the 60,000-yard position.

f. There are no burned spots or marks on the scope screen.

Corrective Measures.

a. Check the scope screen for burns by turning down the INTENSITY control to minimum position. Turn the screwdriver adjustments 30,000 CENTER (or 60,000 CENTER) and HOR. ADJUST all the way to the left. Any marks remaining on the screen constitute a burn. Return the controls to their normal position.

b. If the sweep line is not centered, adjust the screwdriver control to correct this.

c. If the rectangular coordinate grid and the circular scale on the PPI scope are invisible or dim, adjust the PPI GRID and PPI SCALE knobs to obtain the desired brilliance.

Remarks. A screwdriver is located in a holding clip on the inside surface of the door below the PPI scope.

ITEM 14, RANGE OSCILLOSCOPE.
Sample Entry:

14 Range Oscilloscope	[Oper. Cond.] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if range oscilloscope (fig. 12) is operating normally; enter N* if it is not, and explain under NOTES. The range oscilloscope is operating normally if:

a. The range oscilloscope FOCUS control can be adjusted to obtain correct focus.

b. The range oscilloscope CENTERING control can be adjusted to center the sweep trace on the screen.

c. The range oscilloscope INTENSITY control can be adjusted to produce a sweep of proper brilliance.

d. The sweep is steady on the screen.

e. The number of range markers changes from

three to six when the YARDS switch is changed from the 30,000-yard position to the 60,000-yard position.

f. There are no burned spots or marks on the scope screen.

Corrective Measures.

a. If the sweep line is not centered, adjust the screwdriver controls to correct the fault.

b. If sweep length is not correct, adjust the screwdriver controls to correct the fault.

ITEM 15, ELEVATION TRACKING INDICATOR.
Sample Entry:

15 Elevation Tracking Indicator	[Oper. Cond.] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK in the log space if the display on the tracking scope (fig. 14) is normal; otherwise enter N* and explain under notes. The elevation tracking indicator is operating normally if:

a. The tracking indicator FOCUS control can be adjusted to obtain correct focus.

b. The tracking indicator CENTERING controls can be adjusted to center the sweep trace on the screen.

c. The tracking indicator INTENSITY control can be adjusted to produce a sweep of proper brilliance.

d. The sweep is steady on the screen.

e. There are no burned spots or marks on the screen.

Corrective Measures.

a. Adjust the tracking scope controls for FOCUS and INTENSITY.

b. If the sweep line is not centered, adjust the screwdriver control to correct the fault.

ITEM 16, AZIMUTH TRACKING INDICATOR.
Sample Entry:

16 Azimuth Tracking Indicator	[Oper. Cond.] ( ) (OK-N*)	OK	OK	N*

Log Entry. Same entries as required for Elevation Tracking Indicator.

ITEM 17, AUTOMATIC SEARCH.
Sample Entry:

17 Automatic Search	[Oper. Cond.] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK in the log space if operation in automatic search is satisfactory. Enter N* and explain under NOTES if automatic search is unsatisfactory. Automatic search is normal if:

a. The paraboloid rotates continuously in azimuth at a speed of about seven rpm.

b. The paraboloid scans in elevation between the limits set on the elevation search sector cams (fig. 70).

Corrective Measures.

a. Check to see that the AZIMUTH LOCK is pulled out and that the ELEVATION LOCK is loosened.

b. If automatic operation in elevation is not satisfactory, check the elevation search sector cams.

ITEM 18, AIDED RANGE.
Sample Entry:

18 Aided Range	[Oper. Cond.] ( ) (OK-N*)	OK	N*	OK

Log Entry. Enter OK in the log space if aided range operates satisfactorily. If operation is unsatisfactory, enter N* and explain in NOTES. Operation in aided range is normal if:

a. The range pedestal moves when the AIDED RANGE knob (fig. 64) is pushed in and turned.

b. The range pedestal moves in either direction at a rate which varies as the knob is turned.

ITEM 19, PEDESTAL BLOWER.
Sample Entry:

19 Pedestal Blower	[Oper. Cond.] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the blower is in normal condition; otherwise enter N* and explain under NOTES. The pedestal blower is operating normally if air exhausts from the ventilation louvers at the right side of the pedestal.

Corrective Measures. Examine the bottom and right end of the cabinet where the air intake filters are located. If they are covered by obstructions, such as paper on the outstide of the cabinet, remove the obstruction.

Remarks. The trouble may be caused by filters that are clogged with dirt. Do not attempt to remove the filters for any purpose while the set is in operation as dirt might blow into the set.

ITEM 20, SPINNER MOTOR.
Sample Entry:

20 Spinner Motor	[Oper. Cond.] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the spinner motor (fig. 21) is in normal condition; otherwise enter N* and explain under NOTES. The spinner motor is operating normally if:

a. The dipole is spinning.

b. The tracking scopes give normal presentation of tracking pips.

c. The palm of the hand may be held against it for a few seconds without discomfort. The motor normally runs relatively hot.

d. Excessive vibration of the motor is not evident.

e. The front and center bearings on the antenna are cool enough so that the palm of the hand may be held against them without discomfort.

ITEM 21, VENTILATION SYSTEM.
Sample Entry:

21 Ventilation System	[Oper. Cond.] ( ) (OK-N*)	OK	N*	OK

Log Entry. Enter OK in the log space if the operation is satisfactory. If the operation is not satisfactory, enter N* and explain in NOTES. The ventilating system is operating normally if air can be felt coming from the ventilation assembly (fig. 52).

Corrective Measures. If operation is unsatisfactory:

a. Check to see that both ventilation assembly switches on the bottom of the ventilation assembly (fig. 52) are set at ON.

b. Check to see that the TENT BLOWER circuit breaker (fig. 32) is ON.

c. Check to see that the ventilation assembly cable is plugged into the convenience outlet.

ITEM 22, ECHO BOX.
Sample Entry:

22 Echo Box [ ] ( ) (OK-N*)	OK	OK	N*

Log Entry. This test is to be made at the direction of the person in charge.

ITEM 23, BLANK.

ITEM 24, SYSTEM SENSITIVITY.
Sample Entry:

24 *System Sensitivity* (Receiver gain) [%] ( ) (%)	80	85	20*

Log Entry.

a. Enter the setting of the RECEIVER GAIN control, used in checking the sensitivity (initially designated by the person in charge), in the parentheses immediately to the right of the item title.

b. Enter in the open brackets the tolerances specified by the person in charge.

c. Enter in the open parentheses the normal height of echo from the reference target, as designated by the person in charge. This entry will be a percentage of receiver saturation.

d. Enter in the log space the height of the echo signal from the reference target as a percentage of the normal height.

ITEM 25, ORIENTATION.
Sample Entry:

25 *Orientation* (Degrees-Kyd) [ ] ( ) (OK-N*)	OK	OK	N*

Log Entry.

a. Enter in the open parentheses, immediately to the right of the item title, the correct azimuth in degrees and range in kiloyards of the permanent echo which has been selected for this test by the person in charge.

b. Enter in the brackets the tolerances specified by the person in charge.

c. Enter OK in the log space if the azimuth and range of the permanent echo are within the tolerances. Enter N* if they are not.

ITEM 26, SIGNAL-TO-NOISE RATIO.
Sample Entry:

26 *Signal-to-Noise Ratio* (Degrees-Kyd) [50%] ( ) (Ratio)	3/1	3/1	1/1*

Log Entry.

a. Enter in the parentheses immediately to the right of the item title the range and azimuth of the target selected for this test.

b. Enter in the brackets the expected percentage variation in the signal-to-noise ratio, as designated by the person in charge.

c. Enter in the optimum-value parentheses the maximum ratio to be expected from the target selected.

d. Enter in the log space the estimated ratio between the height of the signal and the level of the noise or "grass" on the range scope.

ITEM 27, MAXIMUM RANGE OF TARGETS AND PERMANENT ECHOES.
Sample Entry:

27 *Maximum Range of Targets/P.E.* [ ] ( ) (kyd-kyd)	15/24	75/42	0/5*

Log Entry. Enter in the log space the range of the most distant aircraft target and of the most distant permanent echo observed since the last set of entries was made.

ITEM 28, GROUND CLUTTER RANGE.
Sample Entry:

28 Ground Clutter Range [ ] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the ground clutter, as observed on the PPI scope, is normal. Enter N* if it is not and explain under NOTES. Normal ground clutter will be designated by the person in charge.

ITEM 29, BLANK.

ITEM 30, BLANK.

ITEM 31, LOG FINISHING TIME.
Sample Entry:

31 Log Finishing Time [ ] ( ) (Hr.-Min.)	0015	0225	*

Log Entry. Record in the log space to the nearest minute the time at which the entries for items 1-30 are completed. If for any reason it is impossible to finish the set of entries after it is once started, place an asterisk (*) in the log space and explain under NOTES.

Remarks. This item is not intended as a check on the person keeping the log. The sole purpose is to obtain information which may be of assistance in improving the performance of the set. Accuracy in filling out the log is the most important consideration.

ITEM 32, OPERATING TIME — ON.

Enter the time (using the 24-hour system) that the station goes on the air after each shut-down period. If the station is on the air at midnight, enter 0000 in column A for the following day.

ITEM 33, OPERATING TIME — OFF.

Enter the time (using the 24-hour system) the station goes off the air. The time of each shut-down, whatever the cause, should be entered. If the station continues in operation until midnight, enter 2400 in the last column used. If the station goes off the air because of a break-down or some accidental cause, place an asterisk (*) after the time entry and make a complete explanation under NOTES in section A.

ITEM 34, OPERATING TIME — TOTAL.

Enter the length of time of each period on the air. To get the length of time, subtract the ON entry from the OFF entry (item 33 minus item 32). For example, if the station begins operation at 1415, and shuts down at 1445, the TOTAL operating time is 1445 minus 1415, which equals 0030. When the minutes of the ON time exceed the minutes of the OFF time, it is necessary to transform the last hour of the OFF time into minutes before subtracting. For example, 2400 will become 2360, since the last hour has been changed to 60 minutes. Sample calculations follow:

INCORRECT METHOD		CORRECT METHOD	
Time OFF	2400	Time OFF	2360
Time ON	0530	Time ON	0530
FALSE ANSWER	1870	CORRECT ANSWER	1830

ITEM 35, BREAK-DOWN TIME — TOTAL.

Enter the total time of hours and minutes spent in repairing each break-down. Normally the break-down time is found by subtracting the item 32 entry from the succeeding item 33 entry. If more than three break-downs occur during the day, record the additional break-down period(s) under NOTES.

ITEMS 36-38, WEEKLY SUMMARY.

WEEKLY SUMMARY is the title for items 36-38. The technician in charge during the last watch of the weekly period fills in the summary items.

ITEM 36, HOURS OF OPERATION.
Sample Entry:

36 Hours of Operation	(Hr.-Min.)	120:40

Log Entry. Enter the total number of hours and minutes that the station is on the air during the weekly period. Find this total for the week by adding all of the entries in item 34. Check section A, NOTES, for any operating periods which were not entered on the front of the log because of lack of space.

ITEM 37, BREAK-DOWN TIME.
Sample Entry:

37 Break-down Time	(Hr.-Min.)	01:42

Log Entry. Enter the total number of hours and minutes that the station is off the air during the weekly period because of a break-down or some other accidental cause. Do not include the time the set is off for the purpose of routine preventive maintenance. Refer to item 33, Operating Time—Off, for any entries followed by an asterisk (*). Check the corresponding NOTE in section A to find out whether the set was shut down because of a break-down or some other accidental cause, and whether all of the following periods off the air were spent in trouble shooting and repair. Find the sum of all the break-down periods (item 35) for the week, and enter this total in item 37.

ITEM 38, ACCUMULATED HOURS OF OPERATION.
Sample Entry:

38 Accumulated Hours of Operation	(Hours)	145.2

Log Entry. Add the time in item 36 to the time in last week's log item 38. Enter this total time as item 38, of this week's log.

ITEMS 39-43, SIGNATURE OF PERSON KEEPING LOG.
Sample Entry:

SIGNATURE OF PERSON KEEPING LOG				
39 SIGNATURE	40 RANK	41 DATE	42 ON	43 OFF
John Doe	Sergeant	2 Oct 44	0800	1600
Henry Smith	Sergeant	2 Oct 44	1600	2400

SIGNATURE OF PERSON KEEPING LOG is the title of items 39-43.

ITEM 39, SIGNATURE. When the incoming technician signs his name in this space, he accepts the responsibility for the operation of the station during his watch. If he is not satisfied with the condition in which the station is being turned over to him, he is to place an asterisk after his name. A full explanation must be made under NOTES. Both technicians (the one going off duty and the one coming on duty) must initial this note.

ITEM 40, RANK. Enter the rank of the technician signing the log.

ITEM 41, DATE. Enter the date the technician goes on duty.

ITEM 42, ON. Enter the time the technician goes on duty.

ITEM 43, OFF. Enter the time the technician goes off duty.

ITEM 44, SHEET NUMBER.
Sample Entry:

44 Sheet No.	23

Log Entry. Number the log sheets in order as they are used—1, 2, 3, 4, etc.—one sheet for each week. When one pad of log sheets is used up, begin numbering of the new log pad where the previous pad left off.

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61. HOW TO FILL IN THE BACK OF THE LOG.

a. Heading (items I-VI). Fill in the heading at the start of each new log sheet.

(1) I-III-IV-V. Fill in these items at the start of each new log sheet, following the instructions for corresponding items on the front of the log sheet.

(2) II DISTANCE FROM SEA. Record the distance in feet or miles, indicating the number and the unit of distance used.

(3) VI ELEVATION. Enter the elevation of the

RESTRICTED WHEN BLANK
CONFIDENTIAL WHEN FILLED IN

EQUIPMENT PERFORMANCE LOG

I Radar Set AN/TPL-1 Serial No.

II Frequency Megacycles

III Organization

IV Address

V Location

VI Dates—From through , 19

VII Signature (Person in charge)

Month: Year: Day:

Start first set of log entries 15 minutes after station goes on the air.

	Sunday A	Sunday B	Sunday C	Monday A	Monday B	Monday C	Tuesday A	Tuesday B	Tuesday C	Wednesday A	Wednesday B	Wednesday C	Thursday A	Thursday B	Thursday C	Friday A	Friday B	Friday C	Saturday A	Saturday B	Saturday C
1 Log Starting Time [ ] ( ) (Hr.-Min.)																					
2 Weather Conditions [ ] ( ) (Symbols)																					
3 Temperature Outside [ ] ( ) (°F.)																					
4 Temperature Inside [ ] ( ) (°F.)																					
5 Humidity [ ] ( ) (Abbrev.)																					
6 [ ] ( ) ( )																					
7 Power Unit (PE-35/U) [ ] ( ) (OK-N*)																					
8 [ ] ( ) ( )																					
9 *Line Voltage* [115±10 60~] [115±5 400~] ( ) (OK-N*)																					
10 *H-V Current* [ ] ( ) (Ma.)																					
11 *Crystal Current* [ ] ( ) (Ma.)																					
12 [ ] ( ) ( )																					
13 PPI Oscilloscope [ ] ( ) (OK-N*)																					
14 Range Oscilloscope [ ] ( ) (OK-N*)																					
15 Elevation-Tracking Indicator [ ] ( ) (OK-N*)																					
16 Azimuth-Tracking Indicator [ ] ( ) (OK-N*)																					
17 Automatic Search [ ] ( ) (OK-N*)																					
18 Aided Range [ ] ( ) (OK-N*)																					
19 Pedestal Blower [ ] ( ) (OK-N*)																					
20 Spinner Motor [ ] ( ) (OK-N*)																					
21 Ventilation System [ ] ( ) (OK-N*)																					
22 Echo Box [ ] ( ) ( )																					
23 [ ] ( ) ( )																					
24 *System Sensitivity* [ ] ( ) (%)																					
25 *Orientation* [ ] ( ) (OK-N*)																					
26 *Signal-To-Noise Ratio* [ ] ( ) (Ratio)																					
27 *Maximum Range of Targets/PE* [ ] ( ) (Lyd.-Lyd.)																					
28 Ground-Clutter Range [ ] ( ) (OK-N*)																					
29 [ ] ( ) ( )																					
30 [ ] ( ) ( )																					
31 Log Finishing Time [ ] ( ) ( )																					
32 Operating Time, On (Hr.-Min.)																					
33 Operating Time, Off (Hr.-Min.)																					
34 Operating Time, Total (Hr.-Min.)																					
35 Break-down Time (Hr.-Min.)																					

WEEKLY SUMMARY	Totals
36 Hours of Operation (Hr.-Min.)	
37 Break-down Time (Hr.-Min.)	
38 Accumulated Hours of Operation (Hours)	
( )	
( )	
( )	
( )	
( )	
( )	
( )	
( )	

SIGNATURE OF PERSON KEEPING LOG					
39 Signature	40 Rank	41 Date	42 On	43 Off	

SIGNATURE OF PERSON KEEPING LOG				
Signature	Rank	Date	On	Off

Make entries in ink. Do not use ditto marks. Place an asterisk (*) after an abnormal entry.

W. D., A. G. O. Form No. 11-126 (1 November 1944)

U. S. GOVERNMENT PRINTING OFFICE 16—42127-4

44 Sheet No.

TL 43758

Figure 74. Front of log sheet.

station above sea level in feet.

b. Section A—NOTES. When an asterisk (*) is used on the front of the log sheet, indicating an abnormal condition, give the following information under NOTES in section A:

(1) The item number.

(2) The time and date the abnormal condition was found.

(3) A description of the condition together with the cause.

(4) What was done about it.

(5) Initials of the technician making the note.

c. Section B — COMPONENT RECORD. (1) GENERAL. Fill in section B whenever a *component* is removed and whenever a *component* is installed. No entries are required in spaces blanked out by diagonal rulings. Entries for the component removed are to be made on one of the three lines marked TAKEN OUT (A, B, or C). Entries for the components installed are to be made on one of the three lines marked PUT IN (A, B, or C). Some examples of components are: preamplifier unit, modulator unit, and high-voltage rectifier unit.

(2) COLUMNS 1 to 4. Record the *name, type, serial,* and *order* numbers of the component TAKEN OUT and the component PUT IN. Find the name, type, serial, and order number on the nameplate of the component.

(3) COLUMN 5. SERVICE DATES, IN. In column 5 enter the date that the component TAKEN OUT was originally installed. Find the date of the original installation in the Station Record Book. In the case of a component PUT IN, simply enter the date on which the installation is made.

(4) COLUMN 6. SERVICE DATES, OUT. In this space, record the date that the component is TAKEN OUT.

(5) COLUMN 7. HOUR METER READINGS, IN. In column 7 enter the cumulative hours of operation at the time the component TAKEN OUT was originally placed in service. Obtain this information from the Station Record Book. In case of a component being PUT IN, simply enter the accumulated hours of operation (item 38) in this space and in the Station Record Book at the time the installation is made.

(6) COLUMN 8. HOUR METER READINGS, OUT. In column 8 enter the cumulative hours of operation at the time the component is TAKEN OUT. This reading is usually the same as that entered in the PUT IN line in column 7.

(7) COLUMN 9. HOUR METER READING, TOTAL. In column 9 enter the total time the component TAKEN OUT has been in use. To get this figure, subtract the time recorded in column 7 from the time recorded in column 8. Enter the difference in column 9.

(8) COLUMN 10. REASON FOR REMOVING COMPONENT. In this space explain briefly why the component was removed. For example, it may have failed, it may have been running below optimum performance, or it may have been removed for inspection or servicing.

(9) COLUMN 11. DISPOSITION OF REMOVED COMPONENT. In this space explain exactly what was done with the component after it was removed.

(10) COLUMN 12. WORK DONE BY. This space is provided for the signature of the technician who removed or installed the component.

d. Section C — PART RECORD. (1) GENERAL. Fill in section C whenever a part or tube is *removed* or *installed.* In addition, enter all repairs made on spare equipment. No entries are required in spaces blanked out by diagonal rulings. Entries for a part or tube which has been *removed* are to be made on one of the three lines marked TAKEN OUT (A, B, or C). Entries for a part or tube *installed* are to be made on one of the three lines marked PUT IN (A, B, or C). The description of a part or tube entered on line A, B, or C in columns 1 through 10 must be continued on the corresponding line in columns 11 through 22.

(2) COLUMNS 1 TO 4. Record the *name, type, serial,* and *order* numbers of the component from which the part or tube was removed, or in which the part or tube was installed. Find this information on the nameplate of the component or in the Station Record Book.

(3) COLUMN 5. REFERENCE SYMBOL. In column 5 write down the schematic diagram part number of the part or tube PUT IN or TAKEN OUT. Find this number from the schematic diagram of the component concerned, or on the part itself.

(4) COLUMN 6. NAME OF PART. In this space record the name of the part PUT IN or TAKEN OUT. Find the name of the part on the schematic diagram of the component concerned.

(5) COLUMN 7. DESCRIPTION OF PART. In this space give a brief description of the part PUT IN or TAKEN OUT. Some of this information may be obtained from the parts list. Additional information may be found in the part itself. In this description the name of the manufacturer, the manufacturer's type or catalog number, the electrical rating of the part, its size, etc., must be included.

I. Radar Set AN/TPL-1 Serial No. _____ III. Organization _____ V. Location _____

II. Distance From Sea _____ IV. Address _____ VI. Elevation _____

Sections A, B, C, and D

SECTION B — COMPONENT RECORD — SECTION B

MAKE ENTRIES IN THIS PANEL WHEN A COMPONENT IS TAKEN OUT OR PUT IN

COMPONENT		1 NAME OF COMPONENT	2 NAMEPLATE TYPE No.	3 NAMEPLATE SER. No.	4 NAMEPLATE ORDER No.	5 SERVICE DATES IN	6 SERVICE DATES OUT	7 HOUR METER READINGS IN	8 HOUR METER READINGS OUT	9 HOUR METER READINGS TOTAL	10 REASON FOR REMOVING COMPONENT	11 DISPOSITION OF REMOVED COMPONENT	12 WORK DONE BY—
TAKEN OUT	A												
" "	B												
" "	C												
PUT IN	A												
" "	B												
" "	C												

SECTION C — PART RECORD — SECTION C

MAKE ENTRIES IN THIS PANEL WHEN PART OR TUBE IS TAKEN OUT OR PUT IN

PART		1 NAME OF COMPONENT CONTAINING PART	2 TYPE NO COMPONENT	3 SER. NO. COMPONENT	4 ORDER NO COMPONENT	5 REFERENCE SYMBOL	6 NAME OF PART	7 DESCRIPTION OF PART MANUFACTURER—TYPE—SERIAL NO.—ELECTRICAL RATING—SIZE	8 FUNCTION OF PART AND LOCATION FROM SCHEMATIC	9 NEW, USED OR REBUILT	10 DISPOSITION OF PART TAKEN OUT
TAKEN OUT	A										
" "	B										
" "	C										
PUT IN	A										
" "	B										
" "	C										

PART		11 SERVICE DATES IN	12 SERVICE DATES OUT	13 HOUR METER READINGS IN	14 HOUR METER READINGS OUT	15 HOUR METER READINGS TOTAL	16 SPARES AT SET	17 WHERE DID YOU GET THE PART?	18 SYMPTOM OF FAILURE	19 FAULT	20 WHAT CAUSED THE FAULT?	21 ACTION TAKEN AND RESULTS	22 WORK DONE BY—
TAKEN OUT	A												
" "	B												
" "	C												
PUT IN	A												
" "	B												
" "	C												

SECTION D — REMARKS — RADAR OFFICER

SECTION A — NOTES — SECTION A

ITEM NO. | ITEM AND DATE | ENTER EACH REMARK, CONDITION FOUND AND STEPS TAKEN TO CORRECT IT

IF ADDITIONAL SPACE IS REQUIRED TEAR OUT ANOTHER LOG SHEET AND ATTACH TO THIS ONE.

WHEN COMPLETED SEND LOG SHEET TO UNIT RADAR OFFICER.

SHEET No. ____

U. S. GOVERNMENT PRINTING OFFICE 16—62187-3

Figure 75. Back of log sheet.

TL 43759

(6) COLUMN 8. FUNCTION OF PART AND LOCATION FROM SCHEMATIC DIAGRAM. In this column enter the function of the part PUT IN or TAKEN OUT and its location. In describing the location of electrical parts, locate them in relation to other parts or tubes with which they are associated. For example, first i-f plate-load resistor, bypass capacitor in first r-f stage, etc.

(7) COLUMN 9. NEW, USED, OR REBUILT. Tell whether the part or tube which has been PUT IN is new, used, or rebuilt.

(8) COLUMN 10. DISPOSITION OF PART TAKEN OUT. Tell exactly what was done with the part or tube after it was removed.

(9) COLUMN 11. SERVICE DATES, IN. In column 11 enter the date that the part or tube TAKEN OUT was originally installed. Find the date of the original installation in the Station Record Book. In the case of a part or tube being PUT IN, simply enter the date on which the installation is made.

(10) COLUMN 12. SERVICE DATES OUT. In this space record the date on which the part or tube is TAKEN OUT.

(11) COLUMN 13. HOUR METER READING, IN. In column 13 enter the accumulated hours of operation at the time the part or tube TAKEN OUT was *originally* placed in service. Obtain this information from the Station Record Book. In the case of a part or tube being PUT IN, simply enter the accumulated hours of operation (item 38) at the time the installation is made in the log space and in the Station Record Book.

(12) COLUMN 14. HOUR METER READING, OUT. In column 14 enter the accumulated hours of operation at the time the part or tube is TAKEN OUT. This reading is usually the same as that entered on the PUT IN line in column 13.

(13) COLUMN 15. HOUR METER READINGS, TOTAL. Under TOTAL in column 15 record the total time the part or tube TAKEN OUT has been in use. To get this figure, subtract the time in column 13 from the time in column 14. Enter the difference in column 15.

(14) COLUMN 16. SPARES AT SET. In column 16 give the number of spares of the part or tube PUT IN that are on hand at the set after the installation is made.

(15) COLUMN 17. WHERE DID YOU GET THE PART? Answer this question as clearly as possible. Find out where the part PUT IN came from and explain in the space provided. Examples of entries that might be made are: spare part available; from Lexington Signal Depot; from another set in this area.

(16) COLUMN 18. SYMPTOM OF FAILURE. In the case of a part or tube failure, describe the first indications that the part or tube was faulty. Symptoms are first evidences of trouble. They usually can be detected through the senses of sight, smell, hearing, or touch. Some examples are; abnormal meter reading, the odor of burning insulation, smoke, the hissing noise of an arc, and the heat of an overloaded part.

(17) COLUMN 19. FAULT. In this space describe exactly what fault developed in the part or tube that was removed. Some examples of vacuum-tube faults are: open filament, low emission, shorted elements, gassy tube, microphonic tube, etc. Some examples of electrical faults are: dielectric leak, dielectric break-down, insulation break-down, open circuit, short circuit, arcing, and sticking contacts. Some mechanical faults are: a broken, bent, or cracked part, frayed leads, frozen bearings, and stripped threads. This column refers only to a part or tube that has been TAKEN OUT.

(18) COLUMN 20. WHAT CAUSED THE FAULT? In column 20 explain what caused the fault to occur, using additional space in section A if necessary. Describe any external condition which may have contributed to the fault. Indicate the first or primary cause if it is known. Some examples of causes of faults are: wear and tear in operation, shelf wear, excessive heat, excessive current (overload), high humidity, corrosion, excessive strain, improper adjustment, defective material, accidental damage, error in wiring, lack of ventilation, failure of some other part, and loose connections.

(19) COLUMN 21. ACTION TAKEN AND RESULTS. In this column briefly describe what was done about the fault. In addition, explain briefly what results were obtained.

(20) COLUMN 22. WORK DONE BY. The technician who performed the repair or replacement will sign his name in this column.

e. Section D — REMARKS. Space is provided in Section D for suggestions and recommendations from the men in the field relative to improvements in equipment, or more efficient technical operating procedures. These suggestions and recommendations are valuable and will be given careful consideration by proper authorities.

f. Sheet Number. Number the page in the space provided at the bottom right-hand corner of the log sheet. This number is to be the same as that on the front of the log.

CHAPTER 5
CONVERSION FOR TRAVEL

62. PREPARATION FOR TRAVEL.

Radar Set AN/TPL–1 is transported in Trailer M–1. The directions given below list the steps in the preparation for travel and the loading of the equipment.

a. Preparatory Steps. Preparing the equipment for travel is the reverse of setting it up as indicated by the following steps:

(1) Take down the fly and tent (fig. 55).

(2) Disconnect the power and data cables (figs. 50 and 53).

(3) Pull up the ground stake.

(4) Remove the IFF equipment.

(5) Attach the antenna guard (fig. 49) and put the canvas covers on the telescope and antenna.

(6) Elevate the paraboloid to 1,600 mils and secure the ELEVATION LOCK (fig. 51).

(7) Engage the AZIMUTH LOCK (fig. 50).

(8) Loosen the knobs on the jack struts (fig. 45); raise the jacks and attach the wheels (figs. 46 and 48).

CAUTION: Check to see that the AZIMUTH LOCK is in the IN position, the ELEVATION LOCK is tight, and that all doors and cover plates are in place and secure.

b. Loading. Loading the equipment is the reverse of unloading, as the following steps indicate.

(1) Load the radar set into the trailer with the aid of the winch.

(2) Attach the hold-down fixtures (fig. 46).

NOTE: The turnbuckles that secure the hold-down fixtures to the trailer should be tightened periodically during transportation.

(3) Load the power unit and accessories into the truck.

(4) Couple the trailer to the truck.

APPENDIX I
ORIENTATION AND SYNCHRONIZATION WITH SEARCHLIGHTS

1. ORIENTATION.

Orientation of the radar set with a searchlight consists of paralleling the center line of the searchlight beam with that of the radar beam. The equipment must be in operating condition before orientation is attempted. For complete information regarding the searchlight, see the Operator's Manual for the particular equipment being used.

a. Orientation Using a Distant Point. (1) Point the searchlight drum at a distant ground object or a celestial body, using the orientation sights.

(2) Point the paraboloid of the radar set at the same distant ground object or celestial body, using the telescope.

b. Orientation by Backsighting. (1) Turn the paraboloid of the radar set so that it faces in the same direction as the searchlight.

(2) Move the paraboloid so that the searchlight sights can be seen through the radar set telescope.

(3) Move the searchlight drum so that the orientation sights are trained on the radar set telescope. It will be necessary to sight through the crosswire end of the sight.

(4) Repeat steps (2) and (3) until the orientation sights and telescope are perfectly aligned.

d. Orientation When Sights Are Not Aligned.

NOTE: The following method of orientation may be used if it is known that either the searchlight sights or the radar set telescope is out of adjustment. *The method is an approximation and should be used only in an emergency.* Perform the following two steps simultaneously.

(1) Point the searchlight at the sun so that the focused rays cause the front, or positive, carbon to burn. Observe the image in the mirror to see that the carbon and the sun are centered with respect to one another. Keep them centered, so that the positive carbon does not burn unevenly.

(2) Point the radar paraboloid at the sun so that the shadow cast by the antenna cover is at the center of the paraboloid.

2. SYNCHRONIZING THE DATA SYSTEM.

Immediately after the searchlight and radar set have been oriented, the data system must be synchronized. Both the searchlight and the radar set must remain pointed at the orientation point while they are being synchronized.

a. Operation with 1941 Sperry Searchlight. (1) Connect the 10-pin end of the radar data cable plug to the locator receptacle on the searchlight junction box.

(2) At the radar set, turn the SEARCHLIGHT AND DATA TRANS. switch (fig. 56) to the OFF position. Check to see that the AZ. SEARCH knob (fig. 64) is in the MANUAL position.

(3) Start the searchlight power plant.

(4) Rotate the searchlight azimuth and elevation adjustment knobs until the pointers of the zero readers are centered.

(5) See that the control station zero-reader pointers move to the right when the handwheels are rotated clockwise. If this is not the case, rotate the associated adjustment knob until the adjustment is correct.

(6) Return the searchlight drum to zero azimuth and elevation.

(7) Orient the control station.

b. Operation with 1942 GE Searchlight. (1) Connect the 15-pin end of the radar data cable plug to the 15-pin locator receptacle on the searchlight junction box.

(2) At the searchlight, remove the junction box cover and set the A.C. SELECTOR switch to EXTERNAL.

(3) Set the control station D.E.C. TRANSFER SWITCH to AUTO.

(4) At the radar set, turn the SEARCHLIGHT AND DATA TRANS. switch (fig. 56) to the ON position. Check to see that the AZ. SEARCH knob is in the MANUAL position (fig. 64).

(5) Start the radar power unit.

(6) At the radar set, turn the 60-cycle POWER switch to ON (fig. 35).

(7) At the searchlight, turn the 1-speed azimuth corrector knob until the pointer of the 1-speed zero indicator is centered. Then, turn the 33-speed azimuth-corrector knob until the pointer of the 33-speed zero indicator is centered.

(8) Move the searchlight drum slightly in azimuth

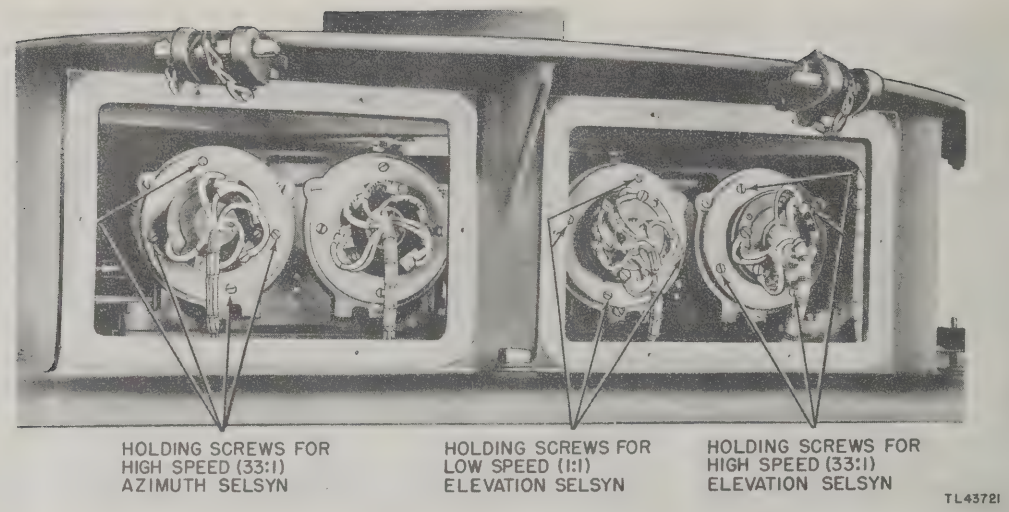

Figure 76. Azimuth and elevation selsyns.

to see that the azimuth zero-indicator pointers move in the correct direction. If they do not, the knobs have been rotated in the wrong direction. Return the drum to zero.

CAUTION: Do not disengage AZIMUTH CLUTCH LEVER on the searchlight after zeroing the data system.

(9) At the searchlight, remove the cover from the elevation control box and place the ELEVATION ZERO INDICATOR SELECTOR switch in the LOW SPEED (1-speed) position.

(10) If the elevation zero-indicator pointer is not centered, turn the 1-speed corrector, located on the housing of the elevation 1-speed control transformer at the searchlight, until the pointer is centered.

(11) Set the elevation ZERO INDICATOR SELECTOR switch to the HIGH SPEED (33-speed) position.

(12) If the elevation zero-indicator pointer is not centered, turn the 33-speed corrector, located in the elevation control box at the searchlight, until the pointer is centered.

NOTE: If the elevation zero-indicator pointer is badly off-center, the following method of bringing it to approximate center may be used. Remove the cover plates on the rear of the pedestal (fig. 76). Loosen the holding screws on the elevation high speed (33-speed) selsyn. Rotate the selsyn by hand until the zero-indicator pointer indicates approximate zero. Tighten the screws and replace the cover plates. Make the final, accurate adjustment by means of the elevation HIGH SPEED ZERO ADJ. on the right side of the pedestal base (fig. 77).

(13) Move the searchlight drum slightly in elevation so that the elevation zero-indicator pointer moves in the correct direction. Set the ZERO INDICATOR SELECTOR switch in the 1-speed position and repeat the check. If the pointer does not move in the correct direction, the correctors have been turned in the wrong direction. Return the drum to zero.

(14) Orient and synchronize the control station according to directions in the searchlight Operator's Manual, TM 5–7045.

c. Operation with 1942 Sperry Searchlight. (1) Connect the 15-pin end of the radar data cable plug to the 15-pin locator receptacle on the searchlight junction box.

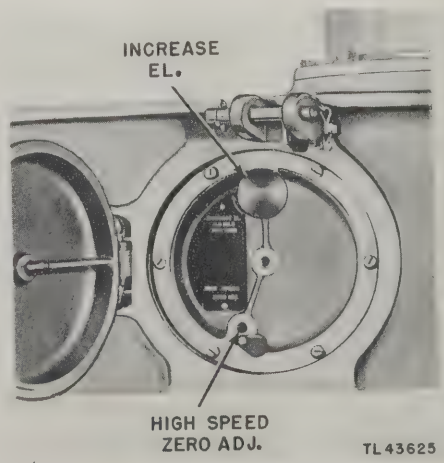

Figure 77. Selsyn-controls, left side of pedestal.

(2) At the searchlight, remove the junction box cover and set the DYNAMOTOR SWITCH to EXTERNAL.

(3) At the control station, set the D.E.C. TRANSFER SWITCH to AUTO.

(4) At the radar set, turn the SEARCHLIGHT AND DATA TRANS. switch (fig. 56) to the ON position. Check to see that the AZ. SEARCH knob is in the MANUAL position (fig. 64).

(5) Start the radar power unit.

(6) At the radar set, turn ON the 60-cycle POWER switch (fig. 35).

(7) At the searchlight, center the azimuth zero-reader pointer by rotating the azimuth synchronizing crank at the searchlight.

(8) Remove the cover from the azimuth drive housing. Hold the ZERO READER TRANSFER SWITCH in the 33:1 position.

(9) If the azimuth zero-reader pointer is not centered, center it by rotating the azimuth HIGH SPEED ZERO ADJ. located in the housing on the right side of the radar pedestal base (fig. 78).

NOTE: If the azimuth zero-reader pointer is badly off-center, the following method of bringing it to approximate center may be used. Remove the cover plates on the rear of the pedestal (fig. 76). Loosen the holding screws on the azimuth high-speed (33-speed) selsyn. Rotate the selsyn by hand until the zero-reader pointer indicates approximate zero. Tighten the holding screws and replace the cover plates. Make the final, accurate adjustment by means of the azimuth HIGH SPEED ZERO ADJ. on the right side of the pedestal base (fig. 78).

(10) Release the azimuth ZERO READER TRANSFER SWITCH.

(11) Move the searchlight drum slightly in azimuth with the ZERO READER TRANSFER SWITCH in one position and then the other to see that the azimuth zero-reader pointer moves in the correct direction. If it does not, the synchronizing crank or HIGH SPEED ZERO ADJ. has been turned in the wrong direction. Return the drum to zero.

(12) If the elevation zero-reader pointer is not centered, center it by rotating the knob marked INCREASE EL. (fig. 77), located in the housing on the left side of the radar pedestal base.

NOTE: If the elevation zero-reader pointer is badly off-center, the following method of bringing it to approximate center may be used. Remove the cover plates on the rear of the pedestal (fig. 76). Loosen the holding screws on the elevation low-speed (1-speed) selsyn. Rotate the selsyn by hand until the zero-reader pointer indicates approximate zero. Tighten the screws and replace the cover plates. Make the final, accurate adjustment by means of the INCREASE EL. knob on the left side of the pedestal base (fig. 77).

(13) Remove the cover of the elevation drive housing at the searchlight. Hold the ZERO READER TRANSFER SWITCH in the 33:1 position.

(14) If the elevation zero-reader pointer is not centered, center it by turning the HIGH SPEED ZERO ADJ., located in the housing on the left side of the radar pedestal base (fig. 77).

NOTE: If the elevation zero-reader pointer is badly off-center, the following method of bringing it to approximate center may be used. Remove the cover plates on the rear of the pedestal (fig. 76). Loosen the holding screws on the elevation high-speed (33-speed) selsyn. Rotate the selsyn by hand until the zero-reader pointer indicates approximate zero. Tighten the holding screws and replace the cover plates. Make the final, accurate adjustment by means of the HIGH SPEED ZERO ADJ. on the left side of the pedestal base (fig. 77).

(15) Release the ZERO READER TRANSFER SWITCH.

(16) Move the search light drum slightly in elevation with the ZERO READER TRANSFER SWITCH in one position and then the other to see that the elevation zero-reader pointer moves in the correct direction. If it does not, the INCREASE EL. knob or the HIGH SPEED ZERO ADJ. control has been turned in the wrong direction. Return the drum to zero.

(17) Orient and synchronize the control station according to directions in the searchlight Operator's Manual, TM 5–1723.

d. Operational Adjustments. If it can be seen that a constant follow-error exists when tracking aircraft, adjustment can be made by turning the knobs INCREASE AZ. or INCREASE EL. (figs. 77 and

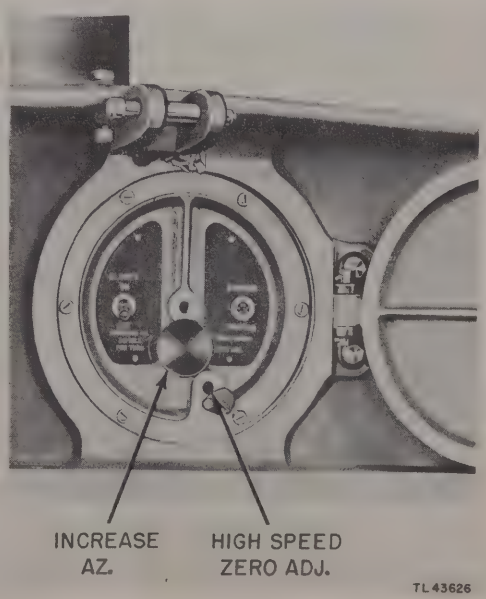

Figure 78. Selsyn controls, right side of pedestal.

78). These knobs cause a searchlight motion of 3.6 mils per turn, in azimuth or elevation. If the light is consistently one searchlight beam-width low when on radar data, correction can be made by turning the INCREASE EL. knob (fig. 77) about 6 turns clockwise, which would then put the light on target.

APPENDIX II
FIRST ASSEMBLY OF SET

1. DIMENSIONS AND WEIGHTS OF CRATES.

Radar Set AN/TPL–1 is shipped from the factory in separate crates. The following paragraphs outline the procedure necessary to assemble the set for operation. After this procedure has been completed properly the set is ready for installation and operation as described in chapter 2 and chapter 3.

a. The following parts are shipped in separate crates:

COMPONENT	DIMENSIONS OF CRATE (in.)	WEIGHT OF CRATE AND CONTENTS (approx) (lb)
Front-wheel assembly (right-end wheels)	71 x 33 x 33½	435
Rear-wheel assembly (left-end wheels)	71 x 38 x 33½	440
Pedestal and antenna assembly (less paraboloid)	50 x 49 x 44½	740
Paraboloid	53 x 51½ x 13½	155
Cabinet (plus units normally contained in cabinet)	109 x 56 x 45½	2,400
Data cable and reel	31¾ x 27¼ x 27¼	257
Power cable and reel	28¾ x 20¼ x 27¼	161

b. Instructions to assemble the front wheels and the rear wheels are given in chapters 2 and 5.

2. ASSEMBLY OF PEDESTAL AND ANTENNA, AND PARABOLOID.

a. Keep the AZIMUTH LOCK (fig. 50) engaged. Keep the ELEVATION LOCK (fig. 51) tight except when aligning scribe marks (par. *g*).

b. Place the pedestal in position on top of the cabinet with the AZIMUTH LOCK to the front of the cabinet. Figure 18 shows the pedestal in place.

c. Six bolts are installed in the base of the pedestal when it is shipped. Screw these bolts into their corresponding holes in the cabinet and tighten them.

d. Remove the left-hand cover plate from the front of the pedestal base. This cover plate may be seen in figure 50.

e. Connect the receptacle behind this cover plate with the plug on the cable that leads up from the cabinet.

NOTE: Removal of the range indicator unit at this point, although not absolutely necessary, will make the work easier. Removal instructions are given in paragraph 3 following.

f. Remove the large panel on the center of the rear of the cabinet, if it has not yet been removed.

g. Rotate the elevation drive shaft (fig. 79) with the fingers so that the scribe marks on the rotating head (fig. 51) are aligned.

h. Rotate the ELEVATION handwheel (fig. 64) so that the ELEVATION dial (fig. 11) reads zero.

CAUTION: Do not loosen the elevation flange. If the flange is loosened, the ALTITUDE and ELEVATION dials (fig. 11) will not read correctly, but this condition will not prevent operation with the searchlight. To correct the dials, the antenna must be aligned according to the directions given in TM 11–1552.

i. Engage the elevation drive shaft (fig. 79) that

connects the main drive and the pedestal. To do this, align the two ends of the shaft by hand. The coupling nut on the main-drive end of the shaft is then screwed on the pedestal end of the shaft. Tighten the nut. Avoid excessive strain on the gearing in the pedestal by holding the lower part of the drive shaft while the coupling nut is tightened.

j. Engage the azimuth drive shaft in the same manner as the elevation drive shaft. The relationship between the antenna position and the azimuth dial reading may be disregarded.

k. Install the paraboloid in position at the top of the pedestal column. To do this, hold the paraboloid in position and engage the aligning pin on the column with the matching hole on the paraboloid. Insert the four holding screws and tighten them.

l. Loosen the ELEVATION LOCK (fig. 51).

3. ASSEMBLY OF R-F COAXIAL LINE.

a. Remove both cover plates from the front of the pedestal base. These cover plates may be seen in figure 50.

b. Remove the cover plate on the rear of the top of the pedestal column (fig. 81).

c. Remove the range indicator (figs. 14 and 26). The removal steps are as follows:

(1) Loosen the four knurled thumbscrews, one on each corner of the cover over the front of the range indicator. Let the cover swing down on its hinges (fig. 66).

(2) Remove the rear center panel on the cabinet (fig. 79).

(3) Disconnect the cable plug from the receptacle on the rear of the range indicator (fig. 79).

(4) Loosen the two wingnuts at the rear of the range indicator (fig. 79), and release their bolts.

(5) Pull the range indicator slightly outward from the front. Pull it out far enough so that the flexible shaft (fig. 79) leading to the PPI yoke is accessible.

(6) Unscrew the flexible shaft coupling at the range indicator (fig. 26) and release the shaft.

(7) Pull the range indicator out of the front of the cabinet.

d. Remove the cover plate that covers the top and back of the main drive (fig. 79). Do this by removing the screws on the back of the main drive. Two are near each upper corner and four are near the bottom edge. Then pull the cover out from the back

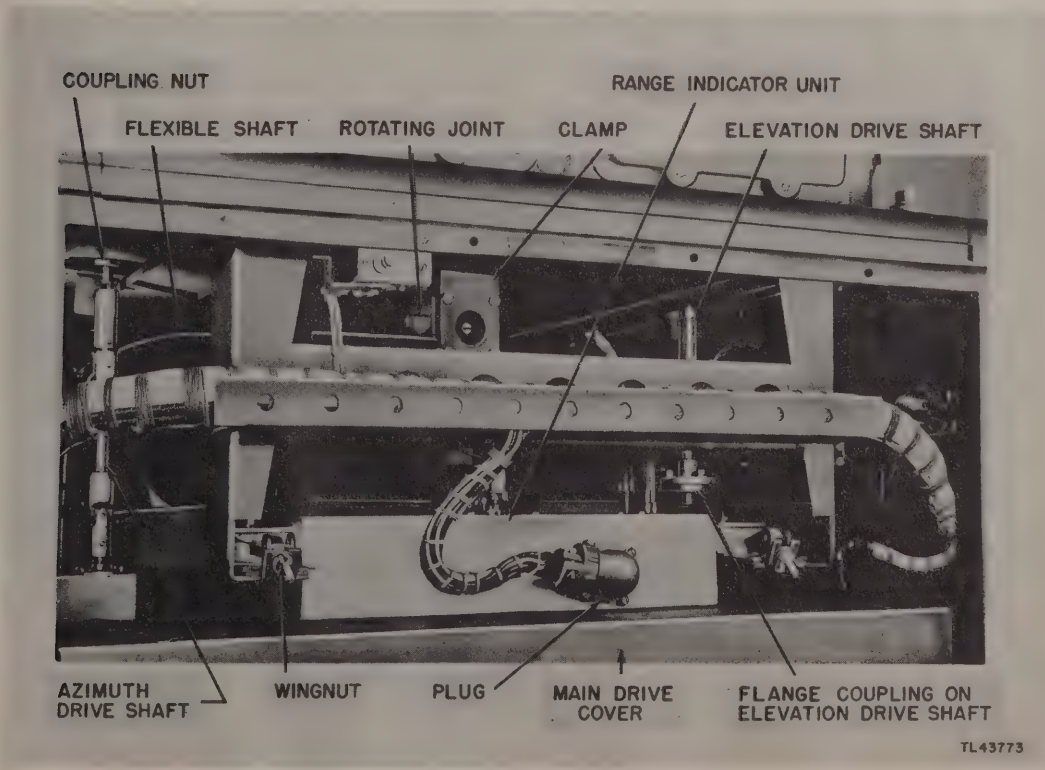

Figure 79. Center section of cabinet, panel removed, rear view.

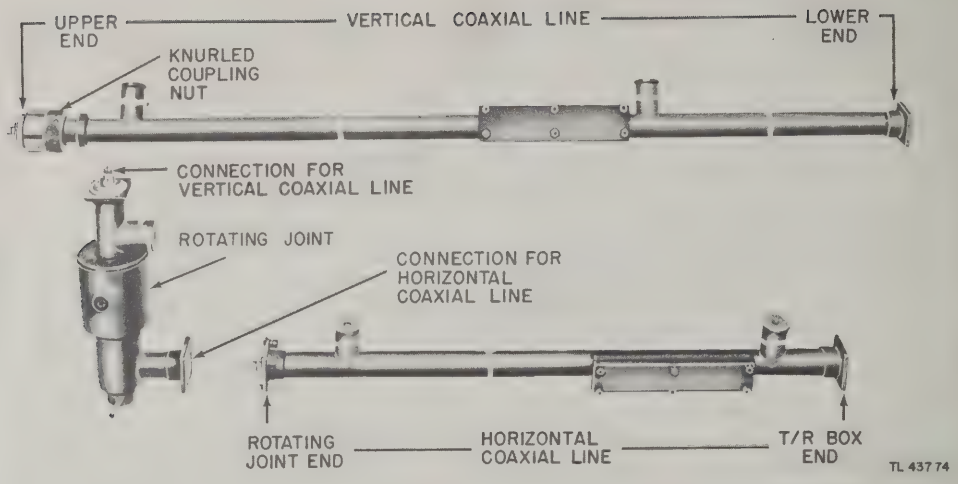

Figure 80. Coaxial lines and rotating joint.

of the cabinet.

e. Remove the cover plate from the center of the bottom of the cabinet.

f. Rotate the elevation handwheel so that the elevation dial reads approximately 1,100 mils.

g. Install the vertical coaxial line (fig. 80) in position in the pedestal column. The vertical coaxial line includes the rotating joint at its lower end (fig. 79). Install the line from the front of the set through the opening formerly occupied by the range indicator and the opening in the bottom of the cabinet.

h. Two men are required to secure the line. One man holds the lower end. The second man stands on the pedestal base and reaches through the hole in the rear of the pedestal column at the top (fig. 81). The second man adjusts the position of the upper end of the line so that the locating pin on it engages the matching slot at the top of the column. The second man then tightens the knurled coupling nut (fig. 81) on the top of the line so that the line is secured to the top of the column. This nut may be started with the fingers. It must be tightened by use of 3/16-inch diameter rod about 6 inches long. The rod is inserted in the radial holes in the knurled coupling nut and used to turn the nut a little at a time until the nut is snug.

i. Rotate the AZIMUTH handwheel (fig. 64) so that the paraboloid points toward the right or the left end of the cabinet. This will allow the vertical coaxial line (fig. 80) to swing so that the horizontal coaxial line may be installed.

j. Install the horizontal coaxial line (fig. 80). This line connects to the rotating joint (fig. 79) at one

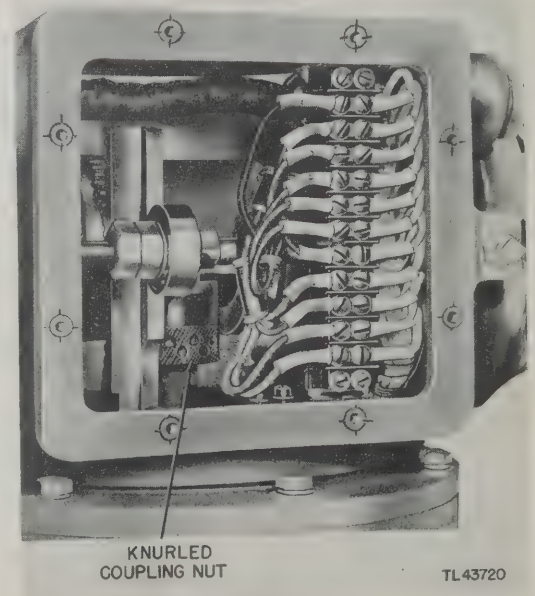

Figure 81. Top of pedestal, cover plate removed, rear view.

end and to the right angle line at the T/R box at the other end.

k. Fasten the rotating joint and the clamp (fig. 79) together.

l. Replace the range indicator unit. To do this proceed as follows:

(1) Slide the range indicator into its rack from the front of the cabinet. Do not slide it all the way in.

(2) Attach the flexible shaft to the PPI yoke on the range indicator (fig. 26) and push the range indicator all the way in.

> **NOTE:** The flexible shaft must be connected so that the azimuth dial reads zero when the direction-indicating line on the PPI also reads zero (points vertically upward). This condition can be checked only while the set is operating. Setting up instructions are given in chapter 2, section II. Starting instructions are given in chapter 3, section I.

(3) Attach the cable connection on the rear of the range indicator.

(4) Pull the AZIMUTH LOCK (fig. 50) to the OUT position.

(5) While the set is operating, rotate the AZIMUTH handwheel until the direction-indicating line on the PPI points vertically upward from the center of the screen, that is, at zero on the azimuth scale (fig. 12).

(6) Observe indication of the AZIMUTH dial. If the dial reads zero, proceed to paragraph *m*. If the dial does not read zero, disconnect the flexible shaft from the PPI yoke.

(7) Rotate the AZIMUTH handwheel until the AZIMUTH dial reads zero. Connect the flexible shaft to the PPI yoke.

m. Close and secure all doors, panels, and cover plates. If they have not been secured previously, close the following:

(1) The cover plate on the top-rear of the pedestal column.

(2) The two cover plates on the front of the pedestal base.

(3) The cover plate on bottom of the cabinet.

(4) The cover of the main drive unit.

(5) The hinged door at the front of the range indicator unit.

(6) The panel at the rear of the center of the cabinet.

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